

Following the hunt

Combining landscapes with a traditional rural pastime, George Wright's series of photographs of a West Country fox hunt convey the atmosphere of the scene and form an attractive collection of images



Fox hunting is a controversial activity and while it appears to be merely picturesque to some, to others it is a cruel anachronism. To others again, the foxes are the real villains and hunting is fully justified.

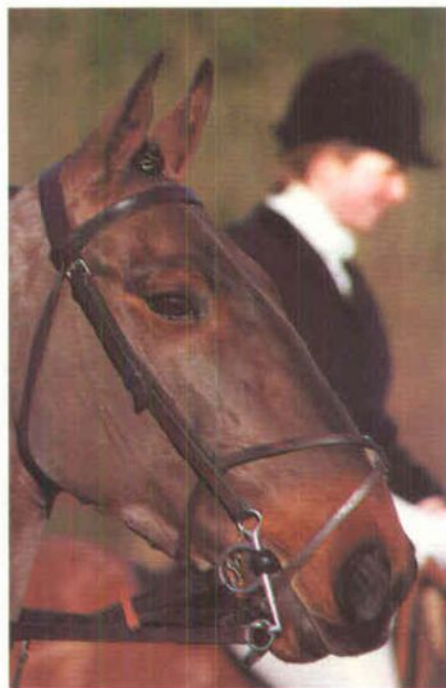
While some go along to a hunt to enjoy the spectacle and others to sabotage, George Wright followed along to make a straightforward pictorial record. His photographs make no comment about this sort of hunting, instead they look at it as a simple spectacle.

For the photographer, a fox hunt offers the chance to try out several different approaches and techniques. Candid, nature and landscape photography can all be explored, both individually and in combination.

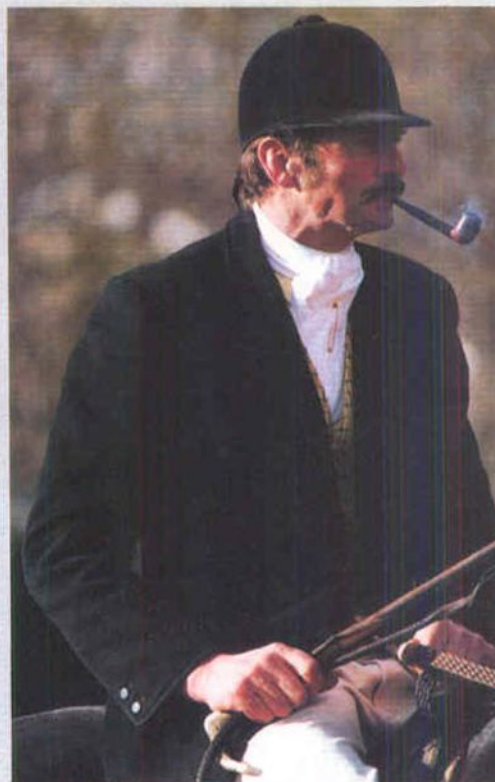
Setting the scene, George started off by photographing the meeting point. These photographs are perhaps the most interesting—the riders mounting, the hounds arriving, the preliminary drinks and close-up shots of the riders on their mounts. A wide angle lens enabled George to include the hounds and the riders together with the overall scene.

Some of the best shots are of the riders in their hunting clothes. The bright red colour of the hunting jackets helped to add colour, particularly in the wide landscape views where the reds complemented the greens. But they also made a feature by themselves. This is seen in the shot of the rider whose head has been left out of the shot. The bright colour is used as an essential element of the image and brightens the shape and form of the composition.

To bring out more detail in the distant shots of the riders in pursuit, George used a 300 mm lens. Many of the photographs taken at the early stages of the hunt were taken with one of George's favourite lenses—a 105 mm which allows sharp images and selective compositions to be made.



George Wright



In the saddle By exploiting the bright colour of the jacket and composing the shot very selectively, George has come up with a detailed and unusual study

Pipe smoker This is a more conventional approach to a similar subject but without the same detail and colour it depends more on the rider's facial expression

White horse While all the preparations were being made, George walked around with his cameras and photographed anything which appealed to him





Fox hounds These dogs in particular caught George's attention. Their faces are very appealing and fortunately the light was just right

Riding away The red jackets of some of the riders improve the more remote views by adding patches of colour which set off the large area of green

In pursuit As the hunt moved further away it became difficult for George to keep up, so he used a 300 mm lens to capture the riders and hounds



Getting in close

A camera and its standard lens focus down to around half a metre —close enough to fill the frame with one page of this magazine. Approaching closer requires the use of specialized equipment

Most standard 50 mm lenses are designed to work at their best when focused on subjects at distances further than five metres. Acceptable images are possible down to about half a metre, and at this distance your standard lens will give an image on film that is about one ninth the size of its subject. The close-up equipment dealt with here can help your camera bridge the gap between this 1:9 image-subject ratio and the large magnifications (beyond about 17 times life size) that you need a microscope to obtain.

Close-up lenses

Close-up lenses are a fairly cheap and simple way of getting a large image. They are often called *supplementary* lenses because they cannot be attached directly to a camera body, but must be screwed into the front of another lens, usually the standard lens.

The power of a close-up lens is generally marked in *dioptries*. Dioptries are simply a measure of the power of a lens. They are equal to the reciprocal of the focal length. A +1 dioptry lens has a focal length of 1 metre, a +2 dioptry lens has a focal length of $\frac{1}{2}$ metre, a +3 has a focal length of $\frac{1}{3}$ metre, and so on. A standard lens fitted with a +1 dioptry supplementary lens would be able to focus on subjects between 40 cm away (with the focusing ring on the standard lens set at 60 cm) and 1 metre away (if the standard lens is set at infinity).

It is possible to use two or more close-up lenses together, but this can lead to some sacrifices in picture quality. Using a +4 with a +2 would, for example, give you a supplementary strength of +6 dioptries. If you do combine close-up lenses, the more powerful lens should be nearer to the camera.

For the price of about three close-up lenses, it is also possible to buy a zoom close-up attachment. This gives a continuously variable power, between, for example, +2 and +10 dioptries.

Though they are light to carry and easy to use, close-up lenses often tend to distort light passing through the edge of the prime lens. This can produce a noticeable fall-off in sharpness around the edge of the image. Some lens manufacturers make close-up lenses that have been specially designed to work with a particular lens. A matched pair gives better results than an unmatched combination although, unfortunately, few lenses are available with supplementary close-up lenses.



Peacock butterfly Good quality like this can be achieved even with a simple supplementary close-up lens fitted to your camera

Reversing ring Many lenses give better extreme close-ups when fitted in reverse with a reversing ring adapter



Extension tubes

One of the most popular ways of getting good, sharp, close-up pictures is to use extension tubes. These are a simple way of increasing the distance between the lens and the film plane, thereby allowing you to focus on subjects much closer than the normal limits of the lens. Extension tubes are usually sold in sets of three, four or five tubes of between about 5 mm and 30 mm. They can be used in any combination to provide a variety of magnifications. The longer the tube used the larger the magnification will be.

When you use a close-up lens, image quality can suffer because light is distorted by the close-up lens before it reaches the prime lens. With extension tubes, however, there is no extra glass and the prime lens can work as it was designed to, and provide a better quality image.

Unfortunately, according to the inverse square law (see page 254), the increased distance between the lens and the film plane with extension tubes causes some light loss. It is relatively easy to compensate for this light loss by using a wider aperture or a slower shutter speed, and if you have a TTL meter compensation is made automatically. But the light loss does restrict the conditions under which extension tubes can be used. With a standard 50 mm lens at the end of 50 mm of extension tubes the image is life size and the lens aperture must be increased by 2 f-stops.

With extension tubes fitted, the link between the lens diaphragm and the camera body is interrupted. TTL metering systems will not work normally, therefore, and neither will lenses that do not stop down the aperture until the shutter is pressed. The problem is solved by 'automatic' extension tubes that have connections for the diaphragm operating mechanism and meter coupling devices. These save you the trouble of setting the aperture manually after focusing each shot, and also allow you to use the TTL meter on your camera in the normal way. Automatic tubes cannot be combined in twos and threes—they can only be used one at a time. Using automatic tubes in combination may even damage the camera.

Despite the drawbacks, a set of extension tubes is more versatile than close-up lenses since they can be used with any lens, regardless of the size of its filter thread. They are usually used in conjunction with the standard lens, but you can use a lens with a longer focal length. With a 90 mm or 135 mm lens, for instance, you can get a large image without having to move in as close to your subject. This extra distance is often very valuable since it permits better lighting, and you can avoid one problem sometimes met in close-up work—that of casting your own shadow on to your subjects.

Bellows

Most professional photographers involved in macro work would probably regard a set of extension bellows as essential equipment. Bellows work on the same principle as extension tubes—they take the lens away from the film plane to increase the magnification. With extension tubes the magnifications possible are limited by the fixed length of the tubes. With bellows, however, moving from one magnification to another is less time-consuming and the image size is continuously variable within the limits of the bellows. This makes it much easier to compose your pictures, filling the frame if necessary with the chosen image.

Most bellows stretch out between 100 mm and 200 mm and can therefore provide more powerful magnifications than a set of extension tubes. Nikon make a bellows extension clamp allowing you to join two sets of bellows together for a total extension of up to 438 mm. Using a 50 mm standard lens, this would fill the frame with a subject less than 5 mm across, but would need 6 stops extra exposure compared to the lens alone.

The lens in a bellows system fits into a metal plate that can move away from, or towards the camera on single or double metal tracks. On some cameras, the lens can be firmly locked in place once the correct focusing distance has been found by tightening a pair of knobs on the bellows.

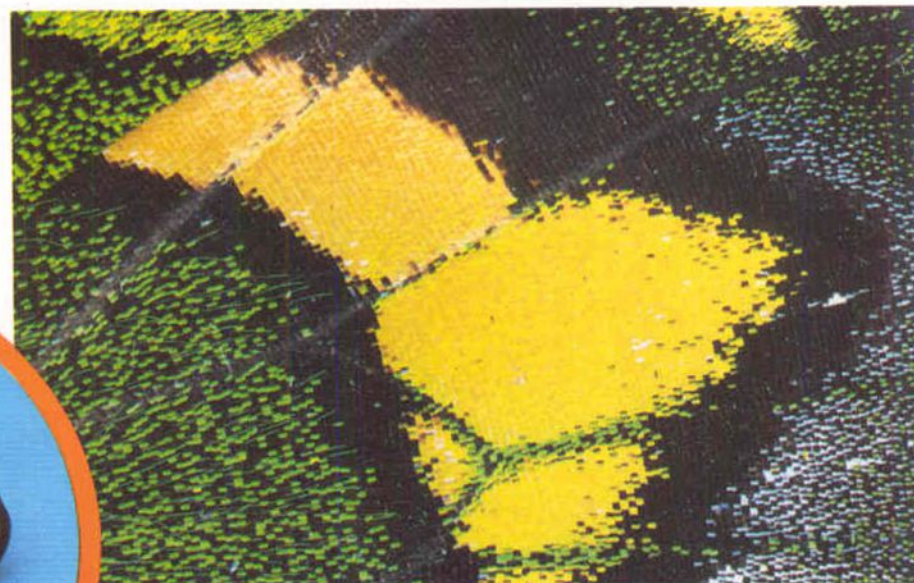
Because of their size and because of the high magnifications they provide, bellows are almost always used with a tripod, or on their own bench stand to keep them steady. In macro work, where high magnifications inevitably mean a shallow depth of field, anything that makes it easier to hold accurate focus is of great value.

Bellows extensions suffer from the same drawbacks as extension tubes. There is inevitably a loss of light, due to the inverse square law, and with ordinary bellows, automatic diaphragm operation is lost. This can be avoided by using a special lens mounting plate on

Close-up lenses Most close-up lenses are inexpensive, fitting to the front of the lens. The camera shown is fitted with a variable power zoom type



Kim Sayer



Nigel Coulton

Wing scales To take photographs of extremely fine detail, such as these delicate wing scales, you will need to use a bellows extension unit

Extension tube set An extension tube fits between the camera and lens, and can be used with a standard lens to form life size images on film



the front of the bellows and a double cable release, but this is an added expense. All bellows sets sacrifice automatic metering—unless the camera reads the exposure from the film surface—and metering will normally have to be done in the stopped-down mode or exposure will be incorrect.

One further problem that is encountered with bellows is that the lens cannot focus back to infinity. This is because even when the bellows are tightly compressed, the lens is still further from the film than it would be if it was attached directly to the camera. It is possible to get around this problem by using a special lens, called a *short mount macro lens*, in which the optical elements are mounted closer to the film. This lens has no independent focusing movement and it is focused simply by

moving the bellows in and out. In this way, it can focus on anything from infinity to a point almost touching the front element. Unfortunately, lenses like this are difficult to obtain.

With some bellows systems you can move the camera back and forth along the base track independently of the lens. This allows you to keep the lens at a constant distance from the subject so the image remains the same size while you move the camera body to bring it into focus. If you do not have this facility, the size of the image changes each time the lens is moved for focusing. This can be very irritating.

Another refinement on some expensive bellows is the facility to tilt the lens up and down and swing it from side to side. This is used to overcome problems caused by shallow depths of field with

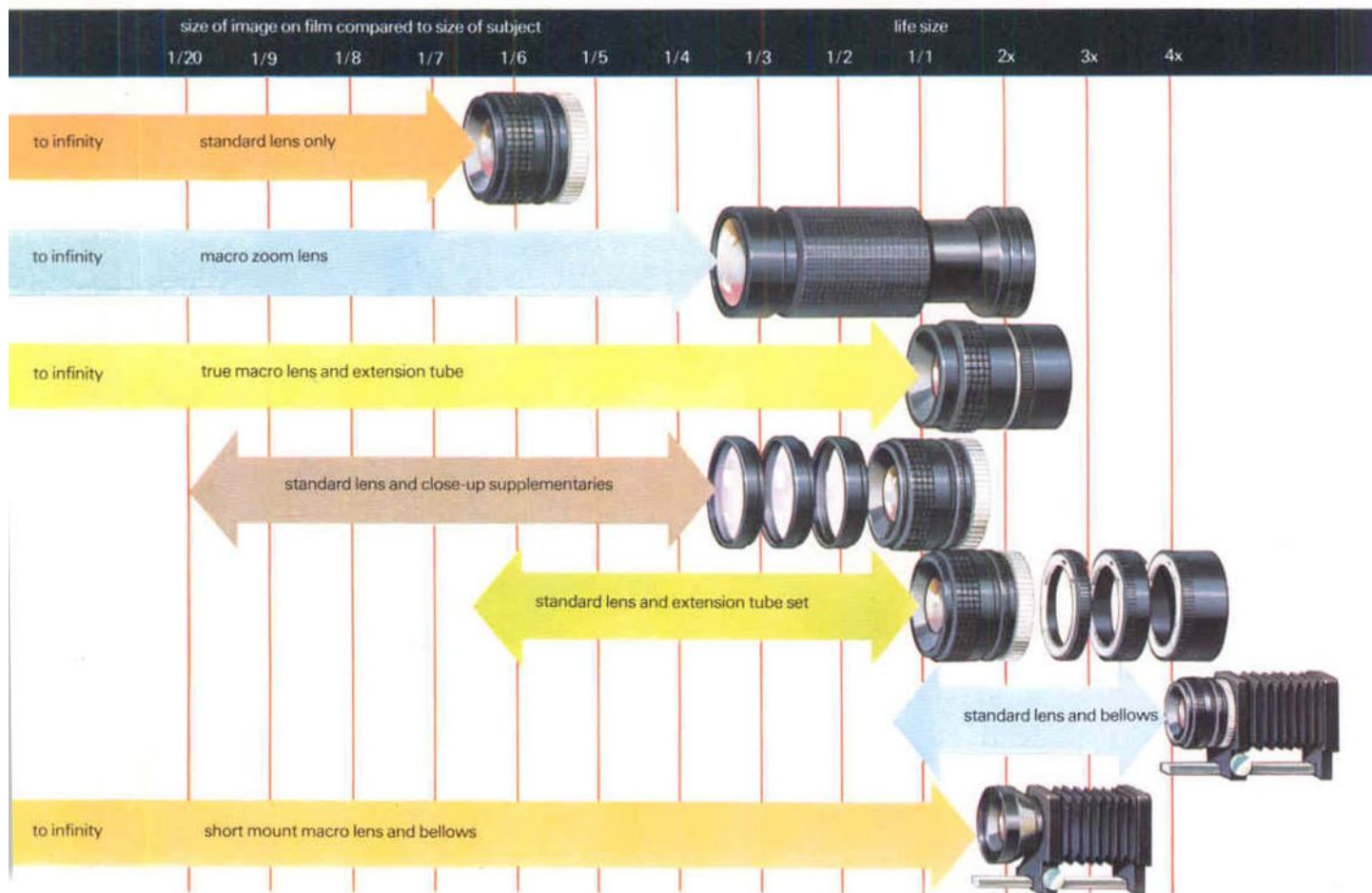
awkward three-dimensional subjects.

Bellows vary in price depending upon whether they are a simple set for outdoor work or a sophisticated large system for studio use. Even the cheapest bellows will probably cost twice as much as a set of extension tubes.

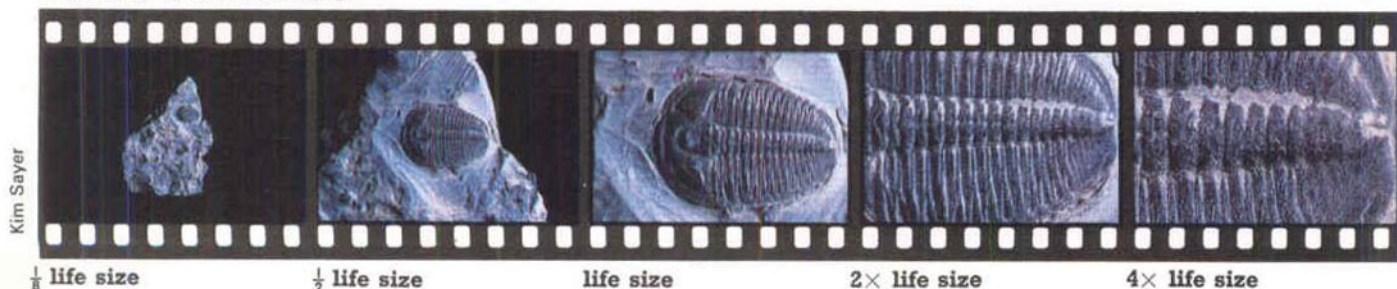
Reversing rings

In normal use, the subject of a picture is much further from the lens than the film and most lenses are designed with this in mind. But when the lens-to-film distance is the same as or greater than the lens-to-subject distance, the performance of the lens is poor. You can get round this limitation by turning the lens round so that the front of the lens abuts the camera body. Of course, there are no suitable mounting points on the front of the lens and you need a special

Close up accessories-how close do they go?



Fossil loaned by Eaton's Shell Shop



reversing ring to make the attachment.

On one side, a reversing ring has a bayonet or screw mount to match the camera in use. The other side screws into the filter thread of the lens. On their own, reversing rings are of limited use and are usually combined with bellows or a set of extension tubes to give a much sharper image than a lens mounted in a conventional way.

Macro lenses

Macro lenses should not be confused with the close-up supplementary lenses mentioned earlier. A macro lens (sometimes called a 'micro' lens) is one that has been specially designed to work best at the short subject-to-lens distances needed to give high magnifications. It is a true camera lens in its own right, capable of focusing from infinity down to a few centimetres and can be used in conjunction with all kinds of close-up equipment. With a macro lens, however, you do not need extra close-up devices unless you want an image-subject ratio greater than 1:2.

Most macro lenses have a focal length of around 50 mm or 100 mm though at least one 200 mm macro lens is available. If you intend to do a great deal of close-up work, therefore, it might be better to buy a macro lens, rather than a standard lens or a normal short telephoto, since a macro of the appropriate focal length could substitute for either of these. A macro lens costs about 20 per cent over a general lens of the same focal length. Unfortunately, the maximum aperture of macro lenses is only about $f/3.5$ and, because they are designed for close-up work, the image quality suffers very marginally when the lens is focused on distant subjects.

Macro zooms

Macro zoom lenses are not the same as macro (micro) lenses. Macro zooms very rarely focus down to the same short distances, and when large magnifications are used, sharpness is often much reduced. They are fine for occasional flower pictures, but where definition is important—copying for example—most of them are useless.

Macro zoom lenses work by moving certain lens elements within the body of the lens while holding other elements in a fixed position. They focus over the normal range using the standard focusing ring, but in the 'macro' mode, focus is achieved by turning the separate zoom ring.

Close-up chart At short distances, the size of the image is more important than the distance from the camera to subject, so enlargement is expressed as a number— $2\times$ means that the actual image size on film is exactly half the size of the original subject. This chart shows the useful range of various combinations of equipment. Exact values depend on the specifications of the individual items, such as the maximum and minimum bellows extension available



Garden spider Careful lighting counts for as much as the right equipment. This garden cross spider would be difficult to spot in its natural habitat

Bellows extension Replacing extension tubes with a bellows set allows greater magnification, and a continuous, uninterrupted focusing range

Lighting

The greatly reduced depths of field involved in macro work may make it necessary to stop down the lens to a small aperture to ensure the subject is properly in focus. You may find that there is insufficient light available for such a small aperture and if you do close-up work regularly it might be worth buying a small flash unit. A ring flash system is the most suitable but these can be expensive. A ring flash unit is a circular electronic flash that is attached around the front of the lens. It produces soft, shadowless illumination that is perfectly suited to macro work.

Macro choice

Before buying any macro equipment you should have a clear idea of the kind of pictures you want to take. If possible, take examples of likely subjects with you when visiting dealers. Then you can see just what the equipment can do.

Different devices suit different needs.



An inexpensive supplementary lens may be perfectly adequate for photographs of small flowers where the centre of the bloom is clear and the outer edges are attractively blurred. The same lens would not be suitable for someone wanting to record a stamp collection faithfully.

Think carefully about how often you are going to be taking close-up pictures that need really pin sharp images. If this is likely to be a frequent occurrence, then it is worth buying a specially designed macro lens, or a bellows system. For most people, though, opportunities for ultra close-up pictures are rare, and one of the simpler accessories such as an extension tube set is quite adequate.

Improve your technique

Studio lighting-1

You do not need a studio to use professional lighting techniques. With a little practice, one light and some simple reflectors you can take excellent picture in your living room

Some people believe that to take successful photographs by studio light, you need massive banks of lamps and an expensive array of complex equipment. But with careful positioning of your subject, camera and light source, you can produce effective and often dramatic results using just a single light.

Indeed, one of the best ways of learning to exploit studio lighting to the full is to begin with a single light source and observe how different angles mould the subject in different ways and create different effects. Portraits, still lifes and many other subjects are well within the scope of the most basic lighting set-up.

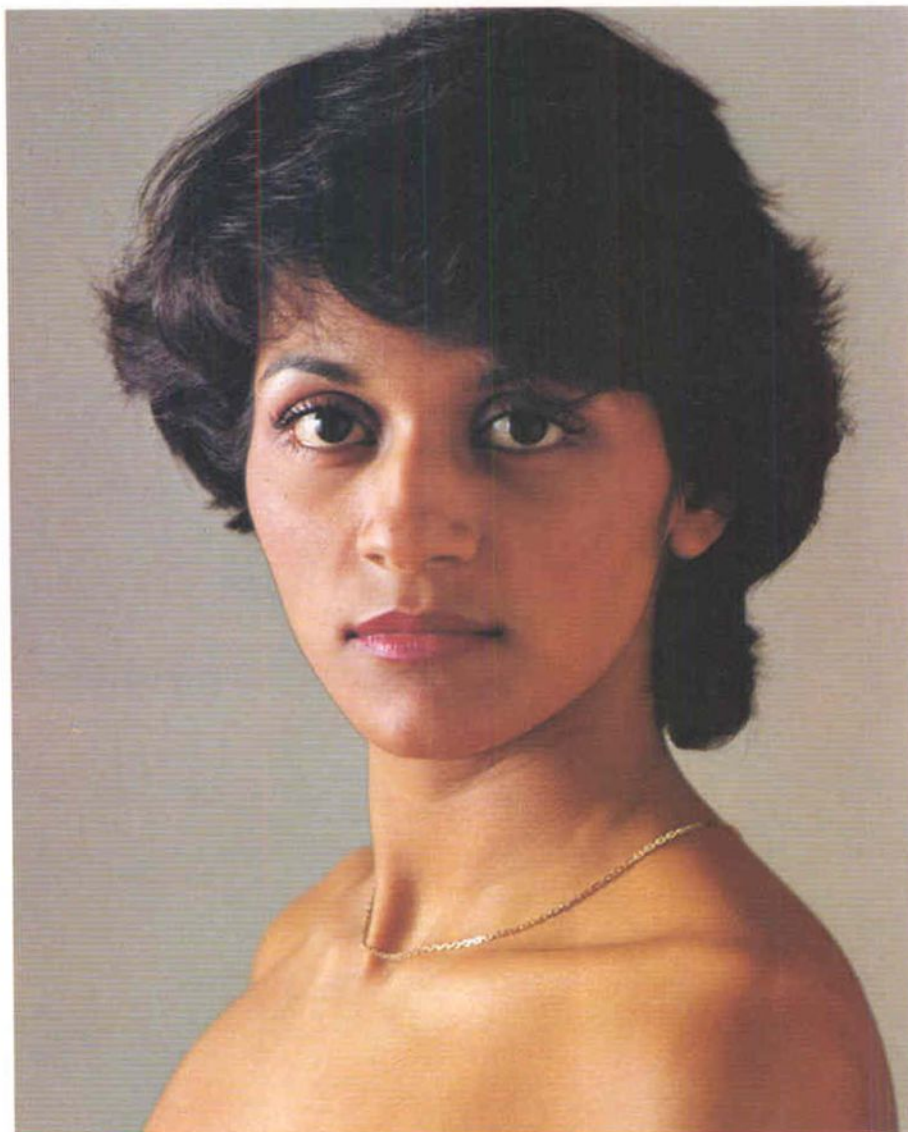
Many professionals prefer to use electronic flash. Such lights illuminate only when the shutter is pressed, except on the very expensive models. This means you can only see the effect of the lighting set-up in the resulting photograph. Once you are experienced with studio lights, this will not matter, but when you first begin it is essential to have a continuous light source, such as a simple tungsten light. With the light on all the time, you can try out different positions and experiment with various effects without wasting valuable film.

Lighting for portraits

Before you move into your 'studio' to try out lighting for portraits with a live subject, it is useful to conduct a few experiments with a model head and a desk lamp. An ordinary metal-shaded desk lamp and a polystyrene model head, like those used in hat shops, will do. Set the head on a table in a darkened room so that the lamp is the only form of lighting. Move the lamp all round the head and note how different angles cast different shadows and accentuate different features. Move the lamp in and out as well and observe how the distance of the light source affects the modelling. And try lighting the head obliquely rather than shining the lamp directly at it. These experiments should give you a basic idea of the way different lighting angles and positions can change the look of your subject. When you move into the studio you will have a basic frame of reference to work from when trying out various effects.

In the studio

Your choice of lighting set-up depends very much on the type of picture you want. Portraits can be high key or low key, in profile or head on, dramatically stylized creations or plain likenesses—



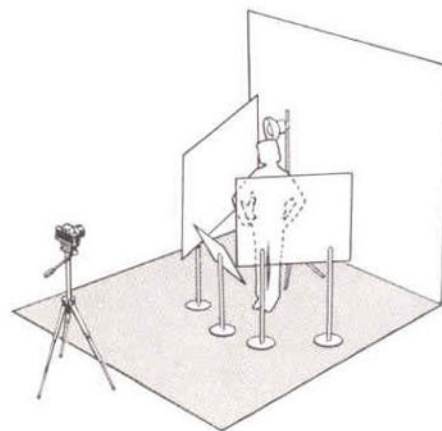
Julian Calder

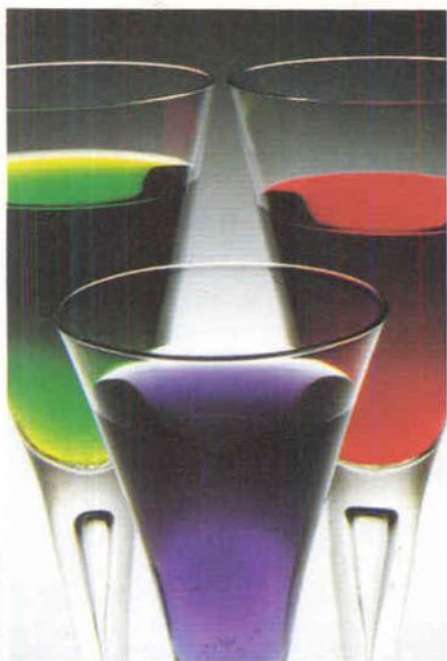
Head and shoulders *The effect of just one light, bounced off a large oblong reflector. To lighten shadows, a square reflector was also used and a small silver reflector threw light on to the model's neck*

all of these require a different position for your single light.

For a straightforward frontal shot, one of the best places for the lamp is in front of the subject and pointing down from an angle of about 45°. This position gives a relatively natural look because shadows fall in much the same way as they would in normal daylight.

With the light at a much steeper angle,





Glasses One lamp, pointed upwards through a sheet of curved Perspex backed with tracing paper, was used to light these glasses of coloured liquid

featured face this can be very dramatic. Lighting from unusual angles often produces striking effects on the right face and it is worth experimenting. If one half of the face is virtually invisible, the lighting helps to create an air of mystery. Actors playing the lead role in a tragedy may often be photographed in this sort of lighting. But for maximum effect the background must be completely dark.

Sidelight also helps to reveal texture and by moving the light slightly forward so that it skims across the face from a very low angle, you may get some fascinating shots of skin texture. Remember again, though, that many subjects will not want any skin blemishes shown.

With the light right behind the subject, the subject's face is in darkness and all you see is a silhouette. The outline of the

sitter, however, will be softened by bright highlights and this lighting is known as *rim lighting*. The highlights are particularly obvious on people with thick curly hair catches the light to create a bright halo.

Because of the bright, dreamy quality this halo produces—looking soft and innocent in some cases, glamorous in others—such lighting is a very popular way of photographing girls. But you need an additional form of lighting on the face. Even though you may be able to see the face clearly, the camera cannot unless you increase exposure to the point where the rim becomes an indistinct white blur and washed out highlights spill on to the face. While the eye can cope with the contrast range, the camera cannot.

Although contrast is extreme with backlighting, even with frontal lighting the contrast between the shadow areas and the highlights produced by a single light source may be too great for the film. While the illumination from a single

some parts of the face are thrown into deep shadow. If the sitter has shallow features, this can sometimes help to give them more strength, but the eyes should usually have some light unless you are striving for an unusual effect. However, a high lighting angle invariably produces a long shadow under the nose and this can look very odd indeed.

Lowering the light much beyond 45°, on the other hand, tends to have a flattening effect. A shallow lighting angle may give complete illumination, but the result is usually dull and rarely flattering to the subject. And once the light is taken down to the same level or below the sitter's head, the face begins to take on a very unnatural look. Old 'horror' films often used a light shining directly upwards from beneath the chin to produce a sinister mask appearance.

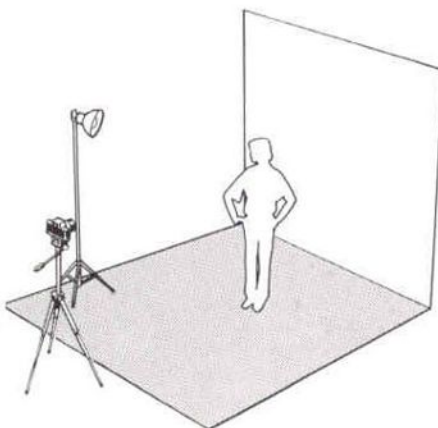
When you choose the height for your light, you must also choose whether to place it directly in front, to one side or even behind your sitter. Again, for a straightforward portrait, the best lighting is probably achieved with the lamp offset to one side by about 45° or perhaps slightly less. A direct frontal setting produces a very flat image while side-lighting tends to look rather unnatural and throws awkward shadows. In the 45° position there are clear shadows to reveal the contours of the face but these are not so large as to obscure much facial detail.

Naturally, because the 45° position is so suitable for simple portraits, it is commonly used. But there are alternatives, and if you want to produce a picture with an unconventional approach, it may be worth experimenting with alternative settings. You must be sure of your subject's cooperation, though, because these unusual lighting positions may give a portrait that is far from flattering.

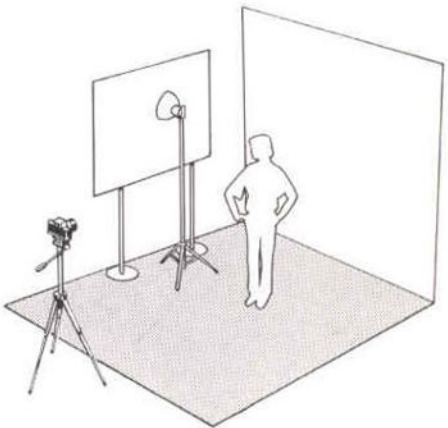
Sidelighting throws one half of the face into deep shadow and on a strongly



Direct light The simplest lighting arrangement of all—one light on a stand, shining down on the model at an angle of 45°. Without a reflector, shadows tend to be harsh and black, but the effect suits some subjects



Side light Placing a lamp directly to one side of the model produces high contrast even when the light is bounced off a large reflector to give it a broader spread. But this can be used to dramatic effect



light placed at a 45° angle above and to one side looks good through the viewfinder, some parts of the face will be in deep shadow in the final photograph. Deep shadow and bright highlights are ideal for the more dramatic approaches, but they are quite unsuitable for straightforward portraits.

Reducing contrast

It is relatively easy to tell whether the contrast range in the subject is to great for your camera by measuring the *lighting ratio*, the ratio between the darkest and lightest parts of the subject. You can measure the lighting ratio simply by moving in close to the subject with a meter—either a separate meter or that in your camera. Take a reading from both the lit and unlit areas of the subject and compare them.

If you are using colour film, there should not be more than about two f/stops difference between the readings from each area. Black and white film is more tolerant and can cope with a

three stop difference, and possibly even more with careful development. But even with black and white film the lighting ratio is likely to be too great with a single light source, so you must find some way of increasing or *filling in* light in the shadow areas.

The most obvious fill-in method is an extra light and this is dealt with in a subsequent article. If you have only one light, however, a simple and very effective method is to use a reflective surface.

Almost any smooth, light coloured surface can be used as a reflector—a piece of white card, a sheet, a white wall or even a mirror. The main problem with a reflector is often finding a way to support it in the appropriate position. Rigid surfaces such as card are therefore better than sheets, although a white sheet provides a large surface.

Finding the right position for the reflector is not always easy and it is worth experimenting with different reflector positions and angles until you

achieve the effect you want. To catch light from your studio lamp, the reflector must be on the opposite side of the subject. It cannot be directly opposite, or the subject will block off the light from the reflector. It must also direct light towards the part of the subject you want illuminated. For a 45° light, the reflector should be to the side and slightly in front of the subject.

There is no reason why you should restrict yourself to a single reflector. Combinations of large and small reflectors may be useful. A large reflector can brighten large shadow areas while a small reflector could be used to highlight important areas of the subject.

Still life

Although this article has concentrated on portraits, there is certainly no reason why you cannot successfully use a single light and reflectors for still life. But when lighting still lifes you must decide what aspect of the subject you want to bring out, as different lighting positions bring



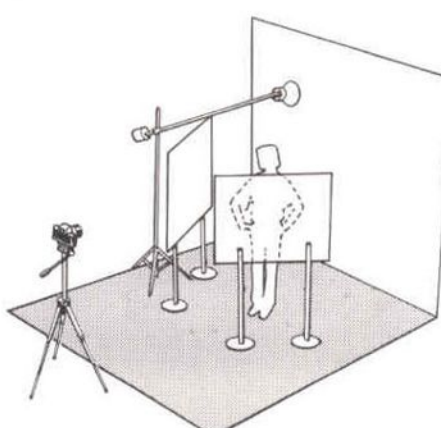
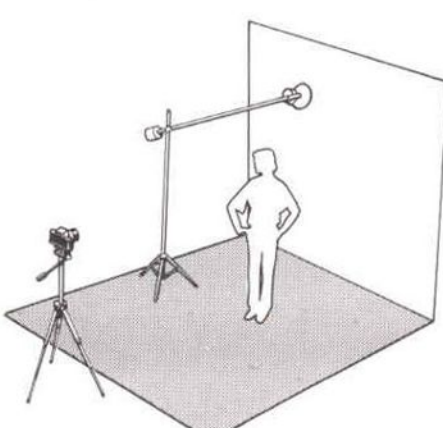
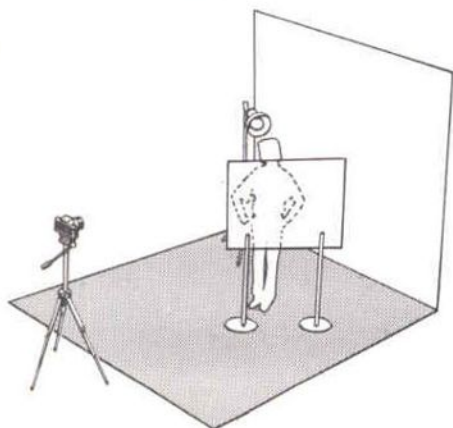
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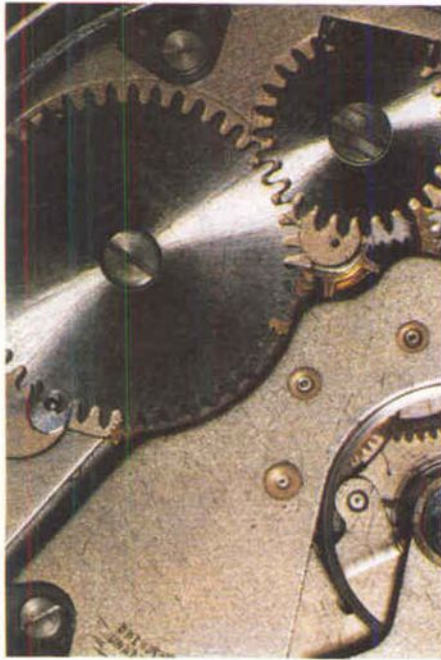


Rear light plus reflector With the lamp positioned behind the model and a large white reflector in front, shadows are less dense. When photographing towards the light, a long lens hood should be used to reduce distracting flare

Back lighting Bouncing the light off the background directly behind the model throws her into silhouette. This gives strong emphasis to her outline, and is particularly effective with portraits taken in profile

Back light plus reflectors The same light as for the silhouette picture, but with two large white reflectors in front of the model. The gauzy translucence of the blouse is emphasized, and shadow detail is retained





Watchworks A single lamp, without a reflector, placed above the subject is enough to light this close-up of a brightly reflective mechanism

out different qualities—detail, form and tone, for example.

For maximum detail, you usually need the light in front of the subject and ample use of reflectors to fill in shadows. Textures, on the other hand, are often best revealed by strong lighting from a shallow angle—almost sidelighting. An effect often used by advertising photographers to create a sense of luxury and opulence is to light their subject from above and slightly behind, with only a little fill-in.

Colour balance

If you are using colour film, particularly colour slide film, with tungsten light, you must place an appropriate filter over either the light or the camera lens to give the correct colour balance. The long-lasting 500 watt photographic

lamps give correct colour with film balanced for artificial light, but the popular short life photoflood bulbs burn hotter and need an 81A filter. Ordinary domestic 100 watt bulbs are redder and need a bluish 82B filter for correct colour.

Filters for the lens are cheap and quite easy to use but many professionals prefer large filter sheets placed over the lights. These sheets are available from shops that sell professional film equipment. Although widely known as 'gels', these filter sheets are usually made of dyed acetate or tough polyester.

The main advantage of this filter method is that it allows you to mix various light sources such as tungsten and daylight. If you use this method, do not attach the filter too close to the light because they can be damaged by the heat. Remember too that gelatin sheets cannot be used over the camera lens because their optical quality is not sufficiently good, and they may cause distortion of the image and spoil your otherwise well thought out shots.



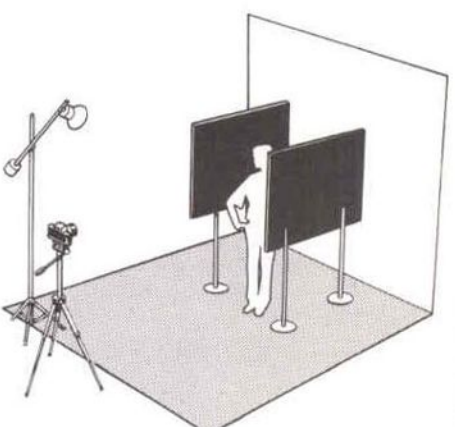
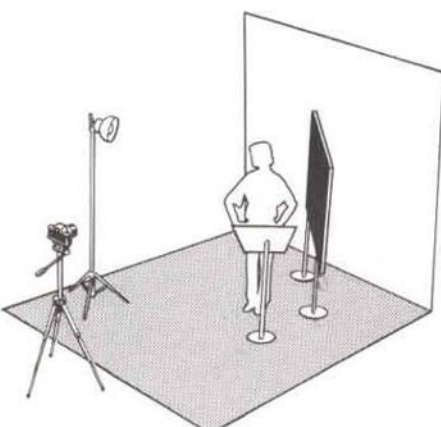
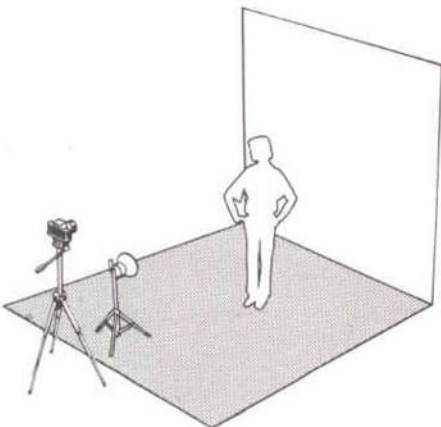
Light from below Positioning a lamp below your model gives a disconcerting effect. Even more bizarre results can be produced by moving the lamp in closer to the model, so that it shines upwards from foot-level



Silver and black A small silver board, to lighten shadows, combined with a large black board. The black board reduces the light on the background and changes the nature of the reflections on the model



Two black boards Frontal lighting from above combined with black boards on either side. All boards used for these pictures were made of lightweight sheets of expanded polystyrene, available from builders merchants



Julian Calder

Advertising Arts



World of photography

Early European photographers

In the mid-1840s the explosion of interest in the new and startling art of photography led to a series of discoveries that were to make this medium available to a wide and eager public

Of all the major inventions the world has seen, none has met with such immediate general acclaim as that of photography. At last a technique had been developed which demanded very little skill and produced permanent images of scenes, objects and people as a lasting record for posterity. It was almost bound to be a great success.

A contemporary witness reported that within hours of Louis Daguerre's photographic process being revealed to the French public on 19 August 1839, 'all the opticians' shops were besieged but could not rake together enough equipment to satisfy the crushing army of would-be-daguerreotypists. A few days later you could see in all the squares of Paris three-legged dark-boxes planted in front of churches and palaces.'

The emergence of this new art came about at a time when the growing middle classes were eager for pictures of all kinds, and most particularly, cheap portraits. The resulting search for new methods of recording images led many to experiment with the effect of light on various chemicals. One of these was the Frenchman, Joseph Nicéphore Niépce. And it was Niépce who produced the first image in 1826.

As a lithographer, Niépce used for his experiments a portable *camera obscura* (literally, dark room), a box generally used by artists to aid their technique. Light entered a sealed box-like chamber through a tiny lens, projecting the scene outside the box upside-down on the inside wall opposite the lens.

Niépce found that bitumen of Judea, a varnish used by engravers, became hard and insoluble when exposed to sunlight if it was first dissolved in lavender oil. He experimented by placing a polished pewter plate spread with this mixture in a camera obscura and exposing it to the light for eight hours. At the end of this time, Niépce immersed the plate in a solvent and an image appeared on the plate. This process was a revolutionary discovery. Niépce called the resulting pictures heliographs—but they were still far from perfect.

The perfection of his method was achieved through collaboration with Daguerre. Louis Daguerre was a painter and set designer who, in 1826, was the

co-owner of the Diorama, a theatre which displayed illusionistic dissolving panoramas using grandiose light displays. Daguerre was also very familiar with the camera obscura and had heard of Niépce's experiments.

After three years' guarded correspondence, the two men entered into partnership in 1829 to develop their ideas and skills. Though Niépce died only four years later, Daguerre went on to develop his process, using a modification of Niépce's technique.

The daguerreotype process Daguerre revealed to the public in 1839 was 'fixed' to a far greater degree than Niépce's original heliograph. After some experimentation with different fixing agents, Daguerre opted for hyposulphite.

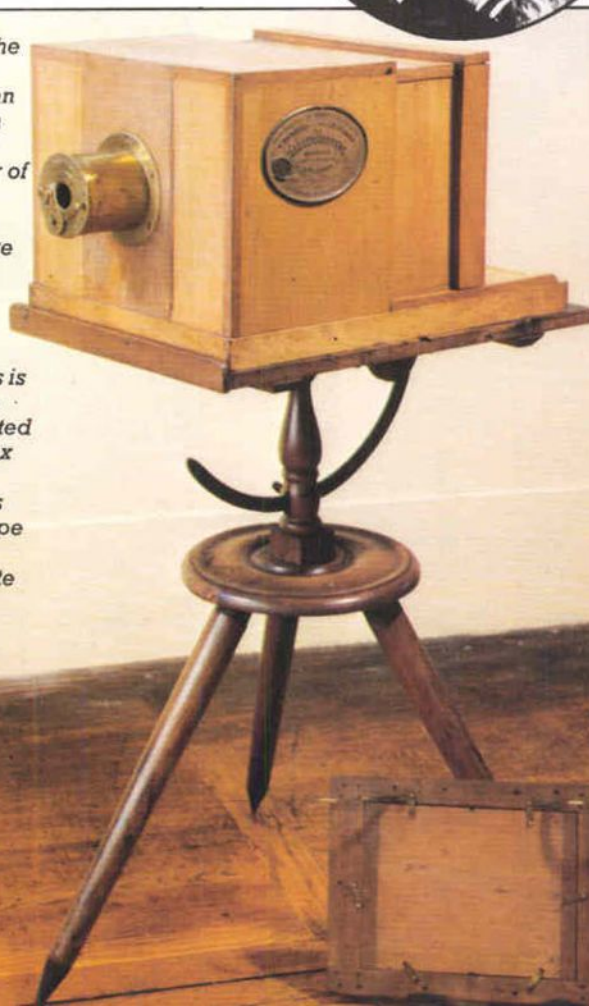
Although Daguerre had not succeeded in producing an image that could be

Société Française de Photographie, Paris

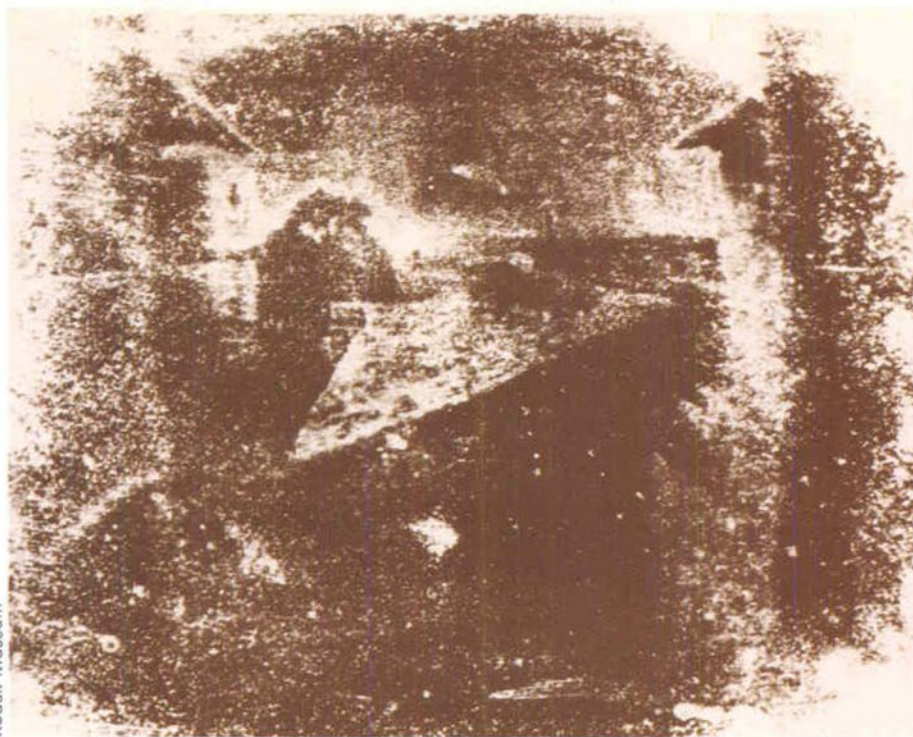


Louis Daguerre The inventor of the daguerreotype in an early portrait taken by J. Sabatier-Blot. Although a pioneer of photography, and something of a showman, Daguerre was unusually camera-shy

Early camera This is the daguerreotype camera first marketed by Alphonse Giroux of Paris in 1839—just after the details of the daguerreotype process were published. The plate holder is resting against the tripod



Science Museum/Cooper-Bridgeman Library



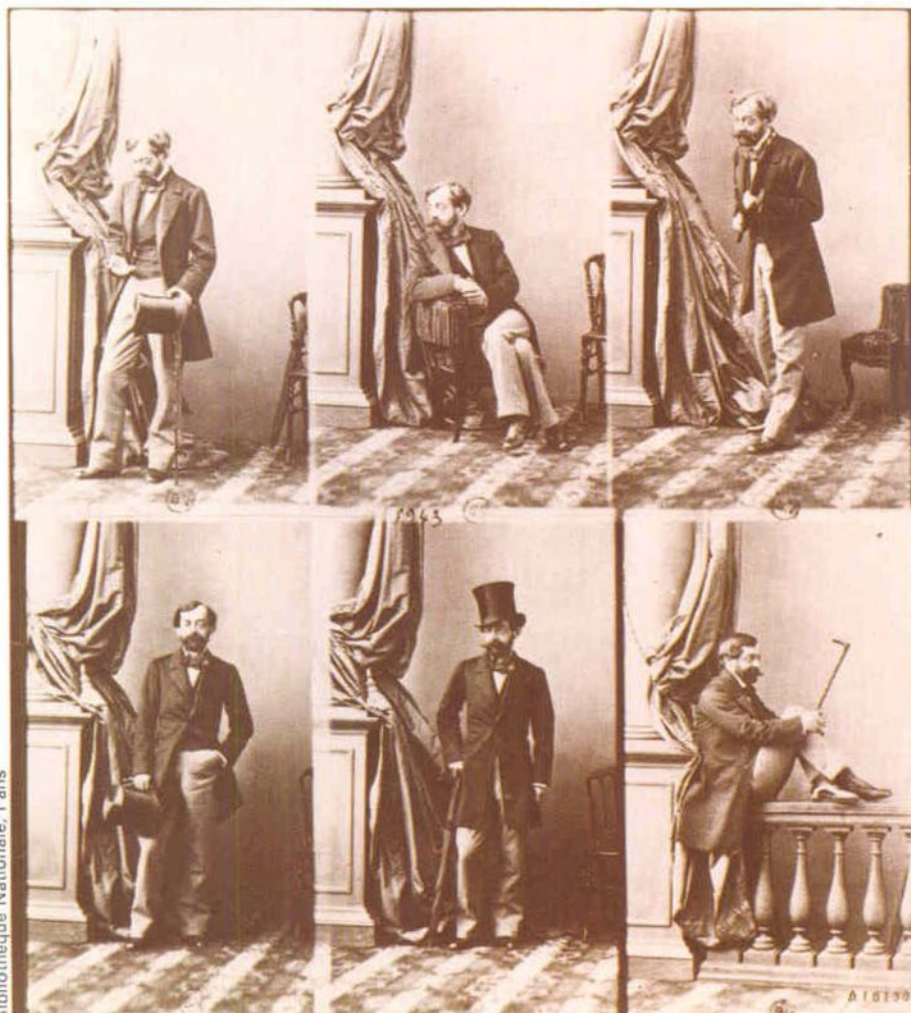
The first photograph A heliograph (sun picture) of the view from the attic window of Niépce's house at Gras—taken with an exposure of eight hours

easily duplicated, such as Fox Talbot was developing at the same time in Britain, he had stimulated the imagination of a far wider public. In exchange for the publication of his information, the French government now granted Daguerre and Niépce's family pensions for their invention and the field was open for its wider use—except in England where Daguerre had patented his invention.

By 1842 hundreds of photographic studios had been opened throughout Europe and North America, and the problems of portrait photography—which were limited by the long exposures needed—had been reduced by three major innovations: Josef Petzval's design of a much improved lens, Hippolyte Fizeau's technique of softening the tones of the daguerreotype, and John Goddard's refinement of light sensitive plates by using bromine, or bromide and chlorine, to treat the silvered plate after it had been treated with iodine. Together, these techniques made it possible to take portraits at exposures of less than a minute.

Despite the development of Fox Talbot's calotype, the daguerreotype reigned supreme for portraiture for the next ten years or more, particularly in the United States where people flocked to the new portrait studios in droves. The image brightness and almost microscopic detail of the daguerrotype were greatly preferred to the calotype's much softer effect. The advantages of being able to make innumerable copies from a calotype negative were offset in the short term by the simpler and more immediate nature of the one-off daguer-

'Cartes-de-visites' This series of portraits were taken at one sitting by Disderi using his revolutionary multi-lenses camera



reotype process.

While Daguerre was still researching his metal plate process, another French man, Hippolyte Bayard, was experimenting with paper photography. Using paper sensitized with silver chloride and soaked in potassium iodide Bayard had produced direct positive images. But though he exhibited 30 photographs in Paris in 1839, his invention was overshadowed by the great publicity that surrounded the publication of Daguerre's process.

Bayard, however, proved to be one of the best of the early French photographers and was naturally bitter about Daguerre's greater triumph and wealth. It was to be two years before Bayard received public recognition in the shape of a mere 3,000 francs awarded him by a French industrial research society for his invention.

Photography on paper, however, was received quite favourably in France by amateur photographers who preferred the more 'artistic' results it gave. In 1850 Louis-Désiré Blanquart-Evard, a merchant from Lille, introduced an improved printing paper, which gave better definition by coating the paper with albumen. Albumen paper came into general use in the early 1850s and remained in use until the end of the century.

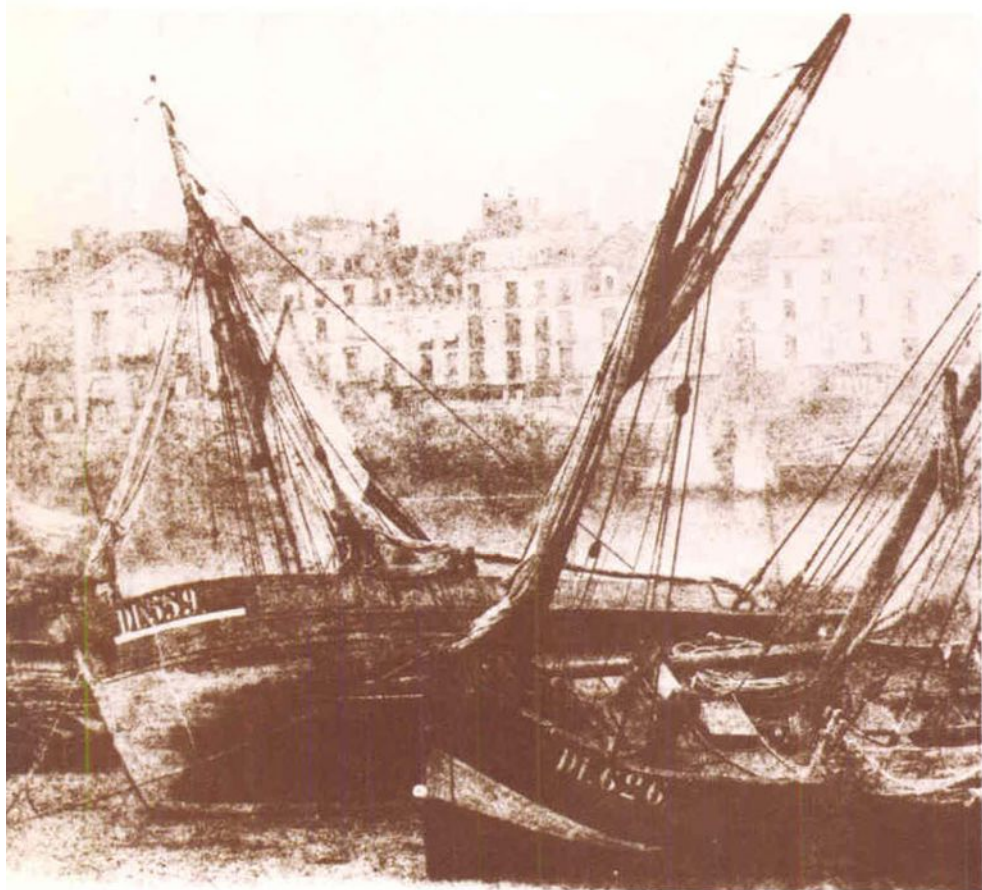


plate was low, it was used for many years for architectural and landscape photography where long exposures did not matter.

1851—the year Daguerre died—also marked the invention of the glass plate which was eventually to supersede all previous processes, from daguerreotypes to calotypes. This was Frederick Scott Archer's wet collodion process—a solution of gun cotton in ether as the medium for distributing an even layer of potassium iodide on glass plates. Being both transparent and rough, collodion was an ideal medium, but the real success of this method lay in the shorter exposures necessary, and the brilliance and detail of the resulting images.

Wet plates—as they came to be

Boats at Dieppe This calotype was taken by Henri Le Secq in the early 1850s. He had been taught by Le Gray and owned a photographic studio in Paris

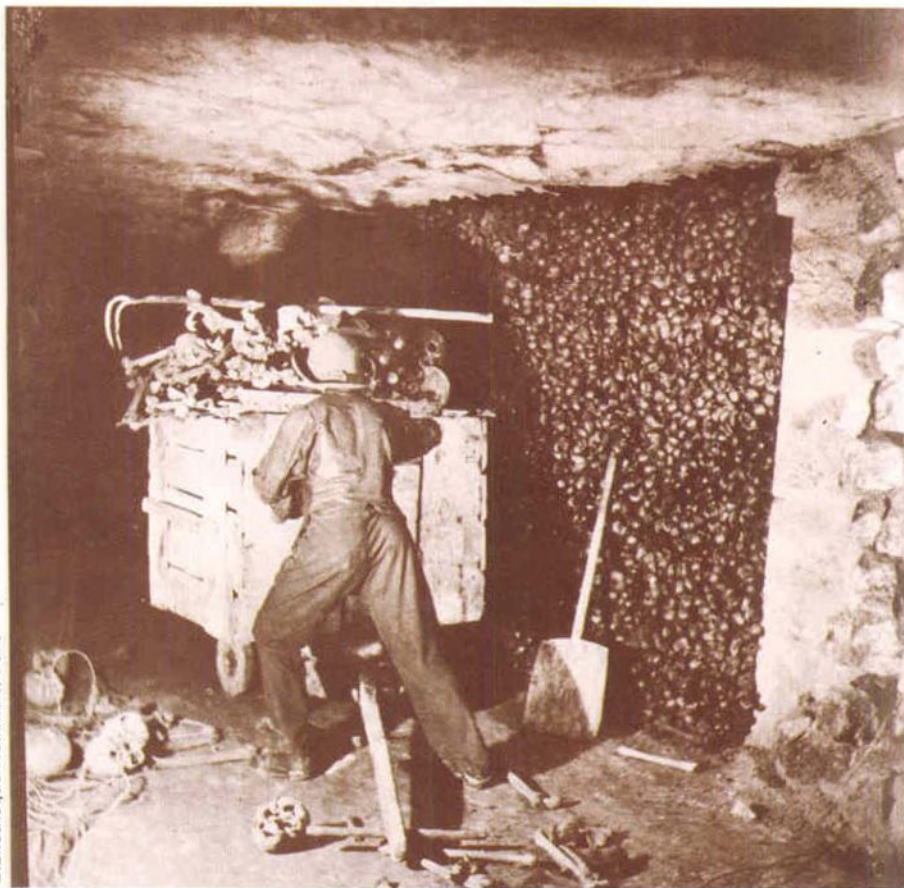
Photographer at work Although Hippolyte Bayard was an established photographer by the 1850s his role as a pioneer was not recognized

Sarah Bernhardt This portrait, taken by Nadar in the early 1860s, demonstrates his great talent for capturing the personality of his subjects

To Baron Gros, a keen amateur photographer, Blanquart-Evrard's invention was 'the beginning of a new era for photography on paper'. With a factory in Lille, Blanquart-Evrard set about printing photographs—mainly of archaeological sites, works of arts and landscapes—which were incorporated in some of the first photographically illustrated books.

By the early 1850s, photography on paper had reached its peak in terms of quality with the invention of the waxed paper process by yet another Frenchman, Gustave le Gray. The paper forming the negative was waxed before being iodized, and proved ideal for the travelling photographer of scenery or archaeological sites. Le Gray's paper could be prepared ten days before being exposed and kept for several days before developing. Being semi-transparent it was also far better than normal calotype negatives for printing and produced far finer detail.

Glass, despite its fragility, was the ideal base—flat, smooth and transparent—on which to coat a photographically sensitized layer. The problem was to make the coating stick to the glass tenaciously enough to withstand the rigours of preparation, exposure, development and fixing. The first person to make a success of preparing sensitized glass slides was Abel Niépce de Saint-Victor, a cousin of Niépce. In 1847 he published a process using a coating of albumen on a glass plate, sensitized with silver salts. Although the sensitivity of the albumen



The catacombs of Paris Nadar took a series of pictures here in 1861 using artificial light and eighteen minute exposures on the models

Seascape Taken at Sete in 1857 by Gustave le Gray who became famous for his seascapes and as the inventor of the wax-paper process



Société Française de Photographie, Paris



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called—had to be sensitized immediately after the formation of the collodion layer and exposed while still damp. Development also had to take place directly after exposure. As well as printing the negative on to albumen paper, the wet plate could be backed with black paint or paper to give a direct positive. Such collodion positives or ambrotypes, were a cheap substitute for the daguerreotype, and were especially popular in America.

Even travelling photographers—the most hard pressed of whom must have been the early war photographers like Roger Fenton or Mathew Brady—found the wet plate collodion method so excellent that they were prepared to carry entire darkroom kits with them.

The photography boom

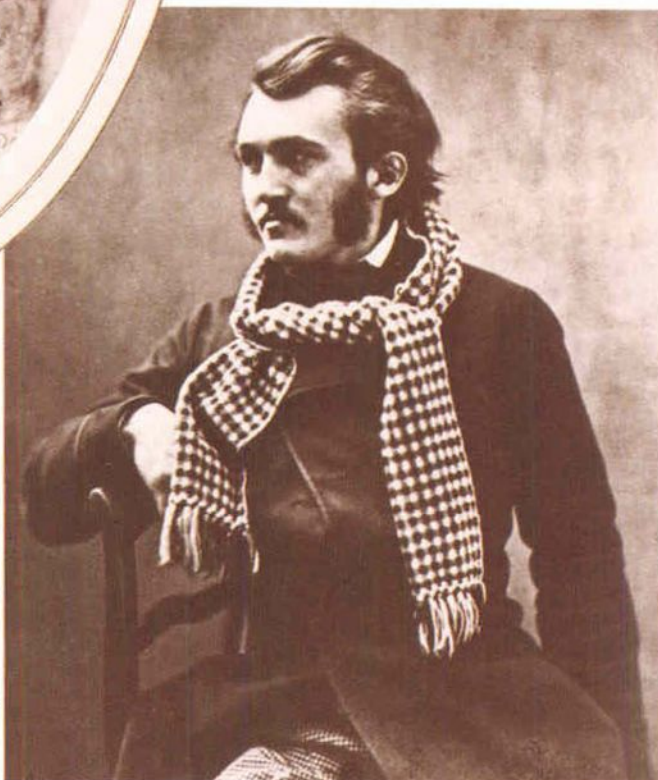
With the new, increasingly successful techniques and ever better results, photography soon caught the popular imagination. In England, patent rights covering the daguerreotype and calotype processes expired in the mid-1850s, and from then on photography grew rapidly in popularity. By 1861 there were some 3000 professional photographers in Britain, where there had been only 50 ten years earlier.

In France, photography was even more popular. In 1861 33,000 people earned a living from photography and

Les Calabrais One of a series of portraits of local characters taken by Disderi in Nîmes where he had a studio in 1853

Gustave Dore Nadar took this portrait of the famous Parisian artist at his studio in the Rue St Lazare in about 1853. It was here that he won acclaim for his superb portraits

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exposures could be made on one plate. The small prints were cut up and mounted on cards about 10 cm by 6 cm. 'All the time and expense necessary to obtain one print from the negative are divided by the number of pictures on the negative', Disderi explained.

After this, the lower middle classes were able to afford to sit for a portrait, as well as the gentry. The small photograph became known as a 'carte-de-visite,' small enough and cheap enough to be exchanged among friends, like visiting cards. The popularity of the carte-de-visite was assured when Emperor Napoleon III was photographed by Disderi in 1859, and by the early 1860s the carte was adopted throughout Europe as the standard form of portrait. In fact, the rush for such portraits was quickly dubbed 'cartomania'. Disderi opened branch studios in Toulon, Madrid and London, and soon became the richest photographer in Europe. His success led to the appearance of a new wave of photographers ready to exploit

its allied trades in Paris alone. The expensive daguerreotype had given way to the cheaper albumen paper print made from a collodion negative. Long queues formed outside portrait studios and more than a million people sat for their portraits. The major figure behind this sudden growth of interest was André Adolphe Disderi, a professional photographer who had opened a studio in Paris in 1853.

Disderi saw that the time required to print each negative kept the cost up. He reasoned that if several negatives were made on one plate the cost of printing could be cut. So he devised cameras with sets of lenses so that up to eight

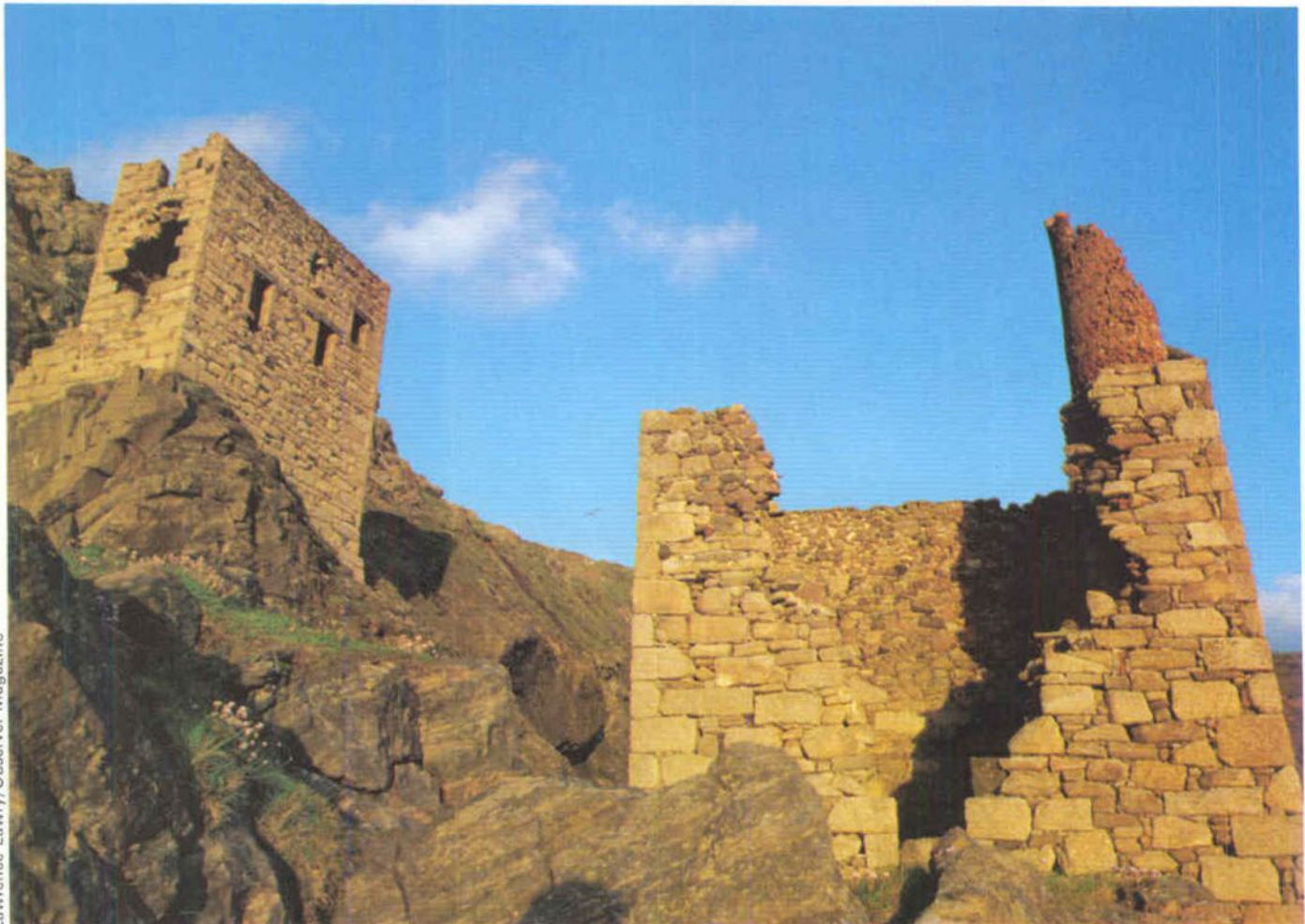
the boom. Soon, mini-portraits of royalty and other famous people were selling in tens of thousands, and were collected just as cigarette cards were to be later.

One drawback of the mass-produced 'carte-de-visite' was that it was rather superficial and stereotyped. There was no attempt, said the famous English portrait photographer, Julia Margaret Cameron, to record 'the greatness of the inner, as well as the features of the outer man.' Cameron remedied this by becoming one of the greatest portraitists of all time: and in Paris, Gaspar Felix Tournachon—known as Nadar—took it upon himself to turn photography into a legitimate art.



Industrial archaeology

Industrial archaeology should not be thought of as strictly specialist subject. Whether you are interested for historical or photographic reasons, there are a great many creative possibilities to explore



Lawrence Lawry/Observer Magazine

Derelict factories, mines, railways, canals and other traces of the early industrial past are mainly the province of industrial archaeologists, yet they can be remarkably photogenic. Sites abandoned because vital minerals ran out or because industrial activity moved to more profitable areas remain as haunting evidence of the way people lived and worked years ago. They are worth searching for.

Old industrial artefacts, from empty copper mines in South Australia to disused tin mines in Cornwall or the abandoned Gold Rush towns of California, can often have such a powerful atmosphere and such fascinating detail that they cry out to be photographed. While they make interesting pictures simply from a historical point of view, they can make an exciting subject even for those not academically inclined. The shape, colour and texture of the archaic buildings and machinery offer a range of



David Hoffman

Tin mine The sort of atmosphere you create in your shots largely depends on the quality of the daylight

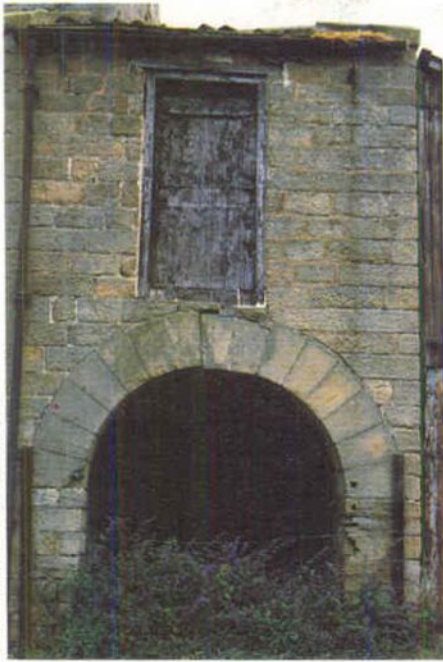
Railway engine Often the whole subject is interesting, but you can also get more unusual shots by focusing on details

pictorial possibilities, especially when augmented by the desolate atmosphere.

Often the better known sites have been fully or partially restored and have become established tourist attractions. These places do have some scope for the creative photographer but often restored sites lack the atmosphere of those which have been allowed to fall derelict. You might also have to contend with modern signs and other anachronisms, so arrive early to avoid other visitors and their cars. These can destroy your shots if allowed to stray into your viewfinder.

Exploring the less well known sites





Archway This photograph of an old mill benefits from the weeds and wild flowers that are included in the frame as foreground interest

Ironbridge This view of a particularly well known site clearly shows the bridge's structure by just framing a selective area

and tracking down your own ruins is far more rewarding. Machinery overgrown with weeds, or flowers growing in broken pieces of old winding gear can make very attractive and moody shots, but are rarely found in tourist sites.

Such sites can, however, be found with patience and perseverance and a detailed map. Old maps can be a help and these may be available at a local library. Local industrial archaeology societies can also be helpful and may be able to give you ideas for several places worth photographing.

When trying to get shots of an old building or an old mine be very careful about safety. It is not advisable to go into any mine unless you are accompanied by someone who knows the location well and is familiar with the potential dangers.

It is possible, however, to find an interesting site wherever you live—docks, canals, a smith or forge, a hammer pond, railway buildings or a mine. They are rarely in the centre of the town—where the traces of the past are buried beneath modern development—but a short search will often reveal industrial relics in the most unexpected places.

Canals, for example, are a good place to start because many of the locks, toll houses and bridges are exactly the same as when they were first built. You may

Pile of slate Composition is the key element of this photograph. The shell of a building is the main subject but the slates guide you towards it

come across an old-fashioned barge with hand painted doors. Things like this can help to recreate the feel of the place when it was once a thriving waterway serving the new industrial mills.

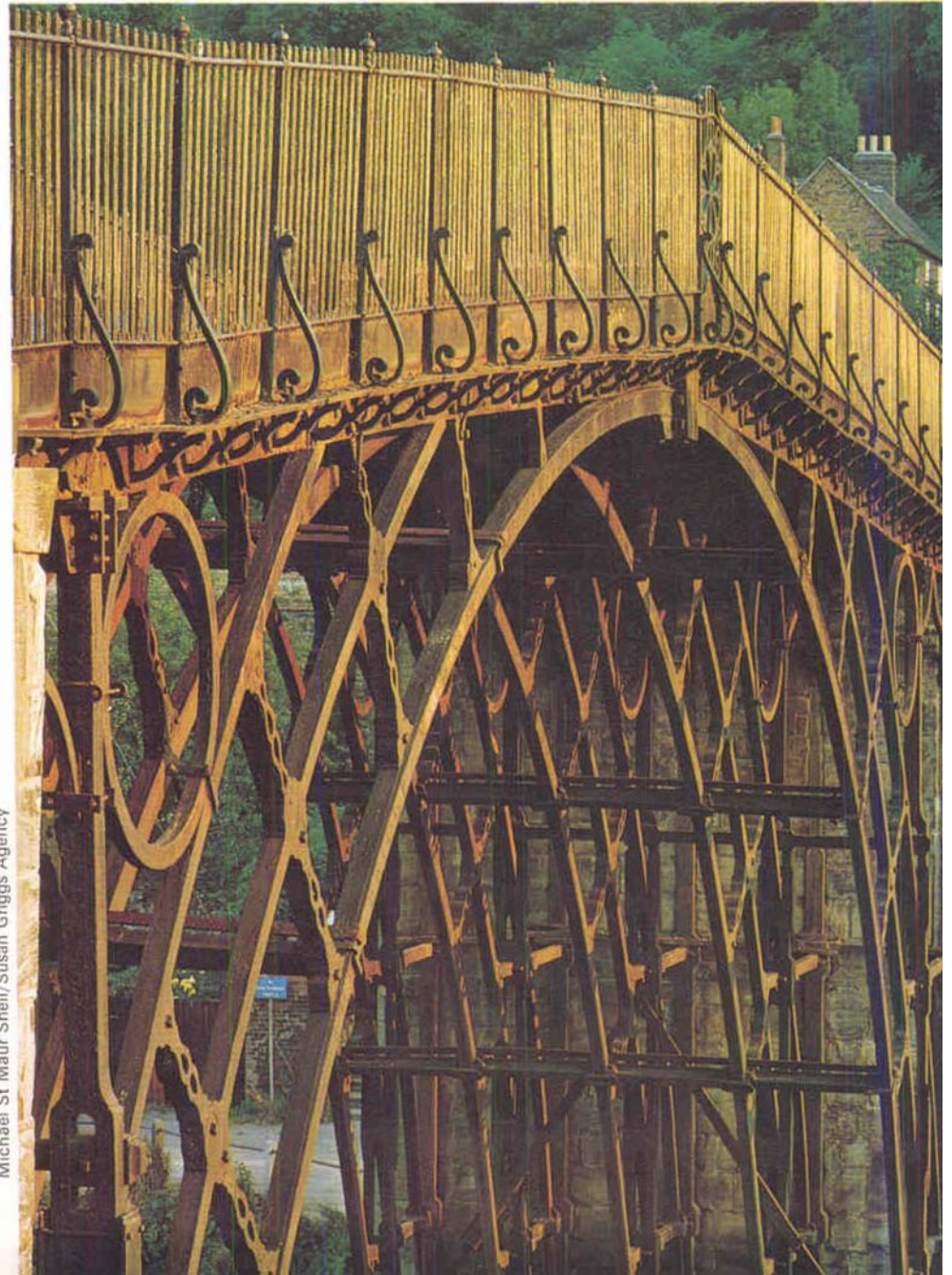
Look out for derelict boats—their fine lines can make beautiful photographs in black and white or colour. Early morning mist can be very atmospheric. Canalside details or bridgework repay careful inspection, while locks and their mechanisms are good subjects in close-up. Vantage points are often easy to find close by, and usually longer focus lenses come into their own for details of ropes and chains.

Different kinds of industrial remains have their own special opportunities. With railways, for example, it is the bridges that often make the most spectacular shots. Railway bridges and viaducts look grand from a distance, framed in their surroundings, but close-ups showing details of construction or repetitive patterns of the serried ranks of components can also be attractive. Try

come across an old-fashioned barge or try taking dramatic wide angle shots of the tracks with the rails almost filling the frame. If there are weeds growing in the tracks, use these in the foreground to emphasize the neglect. Sleepers and chains, signal rods and lineside details, shiny or decayed, all make excellent subjects for creative work.

One of the attractions of such photography lies in the remote grandeur of some early mines and mills. Factory buildings were quite small 200 years ago, and only a few have survived throughout the world. Their general lines are often quite pleasing, and well worth photographing from a distance.

Few factories will have their original machinery still in place, but it is well worth searching for. Parts of steam engines, pictures of gearing in wood or metal, can create the atmosphere of early industry very effectively with careful choice of viewpoint and lighting. It is worth waiting until the sun is in just the right position—coming through a



window, or a broken wall, for example. Light glancing off masonry piers supporting an old beam engine can make a beautiful photograph.

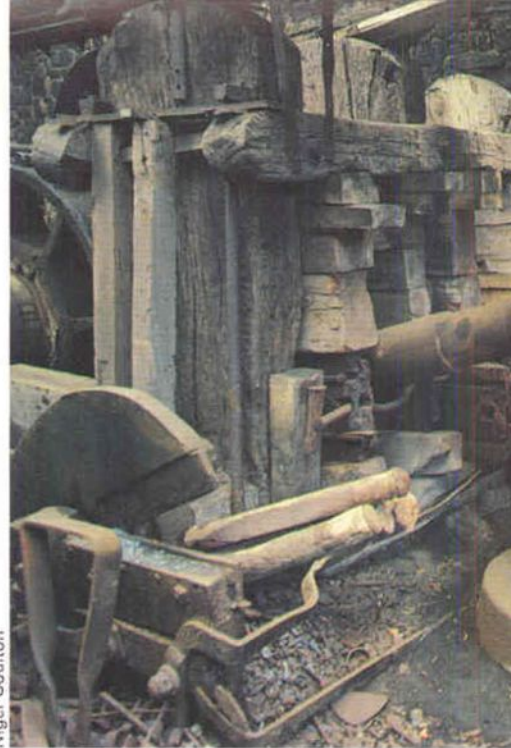
Similar finds can be made among the surface buildings of old mines. The arrangement of the pithead gear can make dramatic long distance shots particularly when shot in black and white on a dull winter's day. Fascinating close-ups abound among the old trucks and tracks and slag heaps. In many countries drift mines are still being worked as they were a century ago, providing an opportunity to picture the faces and actions of the men. This aspect of industrial archaeology is challenging, but action shots of workers in obsolescent industries are the historical record shots of tomorrow, and can make strong evocative photographs.

Wind and water mills have always been popular subjects. With a windmill, you could try moving in close and shooting upwards with a wide angle lens so that the sails loom over you

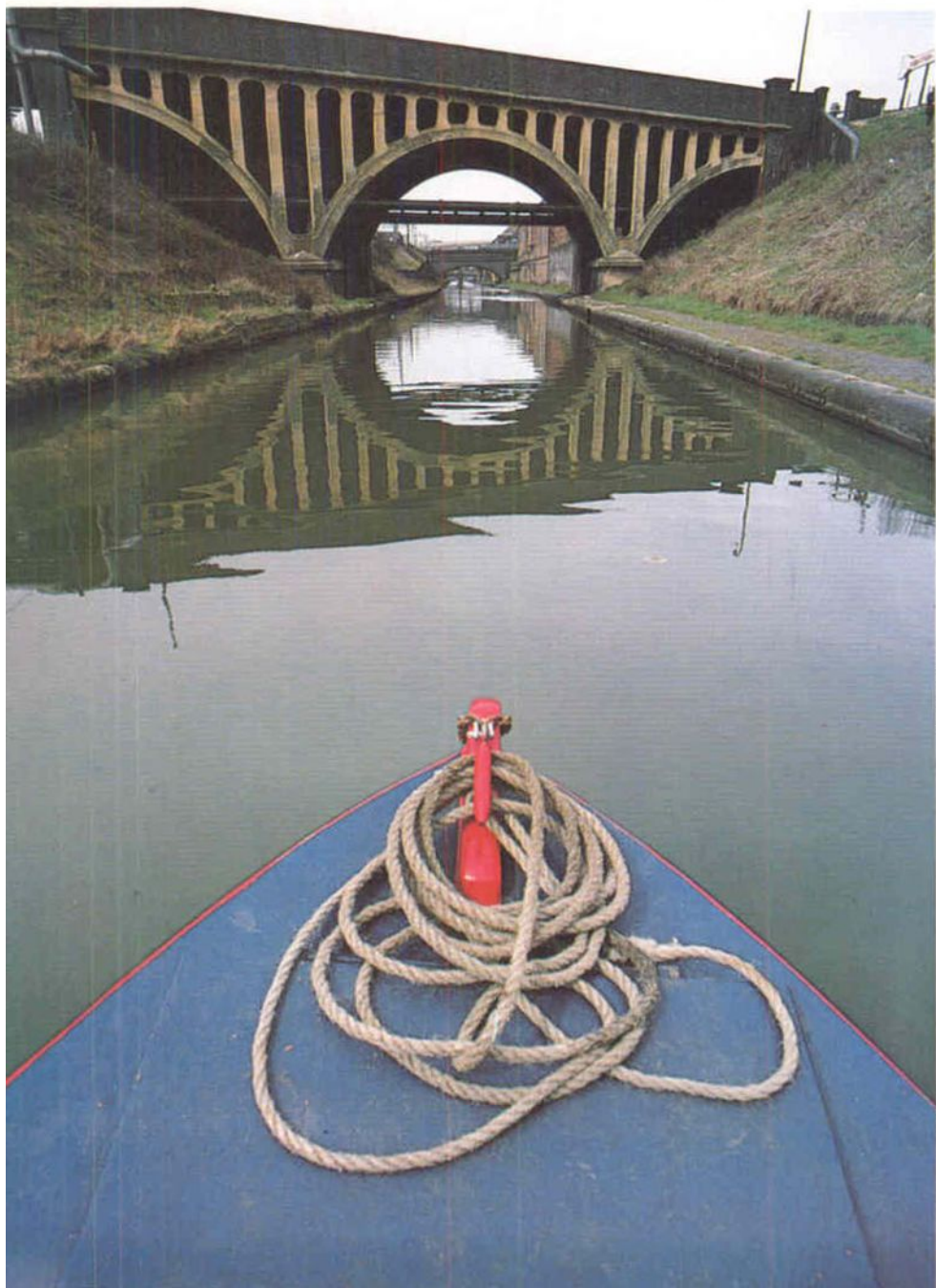
impressively. If the windmill is derelict, you may be able to create an atmosphere of desolation by moving well away and keeping the mill small in the frame. This works particularly well in silhouette on a grey day. Or you could move inside and shoot through the various machine holes, using them to frame the landscape.

Inside a working mill, you can exploit the wonderful subtle textures and colours—the overall buff cast, the rough hessian of the flour bags, the smoothness and rich colour of worn wood, the grey of the millstones and so on. The play of natural light on the machinery can be remarkably photogenic. There is much scope for unusual angles here, with backlit shots and fill-in flash also. Ironwork, timberwork, masonry—all offer great possibilities.

One difficulty is that space is often cramped, and short focal lengths are useful. Another is that it is often difficult to hold the camera steady for the long exposures that might be needed for slow film in low light. You could use a



Nigel Coulton

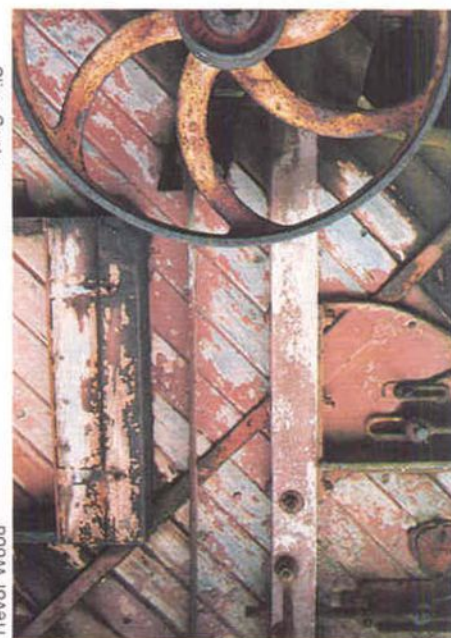


faster film but this might not record all the texture and detail accurately enough. If you do not have a tripod, improvise. Try using a folded pullover as a cushion against a wall, while pushing the camera back into it, keeping well out of the way while making the exposure.

Having found a location, or a group of locations, the rest depends on the way you treat the subject—both technically and creatively. One way to photograph a building, for instance, is to shoot from a distance to include its surroundings

Canal barge Canals have great potential, but to get creative shots you have to try to think of unusual approaches such as this view from the prow of a barge

Idle machinery Obsolete machines have a lot of attraction. Composition, the texture of rust and peeling paint and the subtle, faded colour all help



Clive Coote

Trevor Wood



Foundry There are also a number of interior shots you can try which show the nature of the original work. As well as its setting

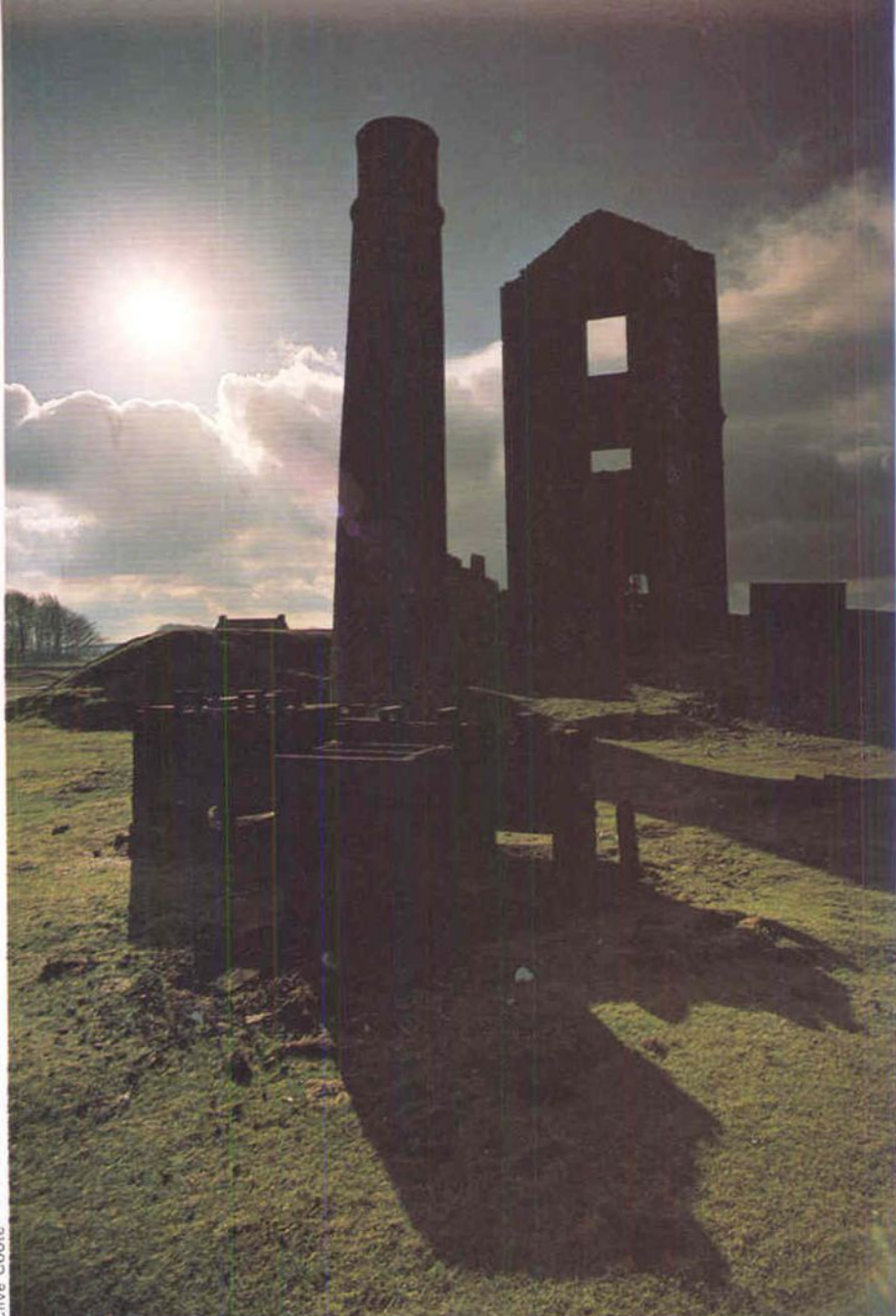
Into the sun Shooting into low sunlight can enhance a scene dramatically. The silhouette effect, the colour of the grass and the long shadows make this shot

and place it firmly in context. This may be particularly telling if the building contrasts with its environment. Many early industrial buildings were built in what are now remote rural areas. Some blend perfectly into their natural background: others stand out dramatically. Old buildings in towns can look equally out of place surrounded by modern development. Contrasts like this are worth exploiting, particularly if you want to show how the nature and character of a place has changed.

To establish more of a mood it may be worth spending some time waiting until the sky and the weather enhances the composition. With experience it is possible to tell when the light is going to change by observing the movement of the clouds and looking for the sun breaking through, or when a dramatic cloud formation will be above the main subject. Watch the effect of light changes and wait for the right moment.

By moving in closer to the object of interest you will be able to concentrate on the care and craftsmanship that went into the construction of these early industrial buildings.

Experiment by photographing your subjects from different distances and, where possible, from different heights and angles, but also try different focal length lenses. Sometimes you will find that a mill or other type of building is so massive that it is difficult to get it all in the frame even with an ultra wide angle lens. In such cases you can often capture the character of the place more effectively



ly by selecting a smaller area.

It is always a good idea to keep in mind the function of the site you are photographing and to use this as the keynote for a series of different shots. Once again, look for attractive details which make shots in their own right or which convey the gloom of idle machinery left over from a bygone age.

The choice of lighting conditions is important and has a great bearing on the atmosphere you wish to create and the purpose of the photographs. If you are photographing a site purely for the purpose of making a lasting record, an overcast day is best since there are no harsh shadows which conceal details. If the light is bright, it may be advisable to take photographs at midday when the light is overhead. Spring is a good time for this purpose since the vegetation is at a minimum and few parts of the building will be obscured.

For pictorial purposes, a different approach is needed. Usually, best

lighting effects are found early in the day or later in the afternoon when there are attractive long shadows and the colour of the light is warm. Time of year does not matter—this is a subject for year round photography. As with all successful landscape photography it is necessary to get up early in the morning to make the best of your subject. The sun caught rising between chimney stacks or through the spokes of a pithead wheel can be very dramatic.

A wide angle lens can create new perspectives if held well away from the vertical—tilting the camera distorts perspective drastically, and this may ruin architectural shots. But, by taking a very close viewpoint, a vertical wall or a horizontal waterway will show foreground interest in a compelling way.

There is infinite variety of subjects to be found in the relics of our industrial past. The creative photographer is limited only by his ability to hunt out a good location.

How film works

You can make simple, light sensitive materials in your kitchen sink, but they are of little use for everyday photography. Commercial emulsions are more sophisticated, but work in the same basic way

When you look at a black and white negative or print, all you are seeing is millions of tiny particles of metallic silver embedded in a thin layer of tough jelly. This emulsion is coated onto a thin sheet of plastic material or paper.

Although this may not sound very exciting, it is the basis of all photographs, even colour films and prints. From such mundane beginnings, superb photographs can be produced, and though the process of image formation is often taken for granted, it makes a fascinating story in itself.

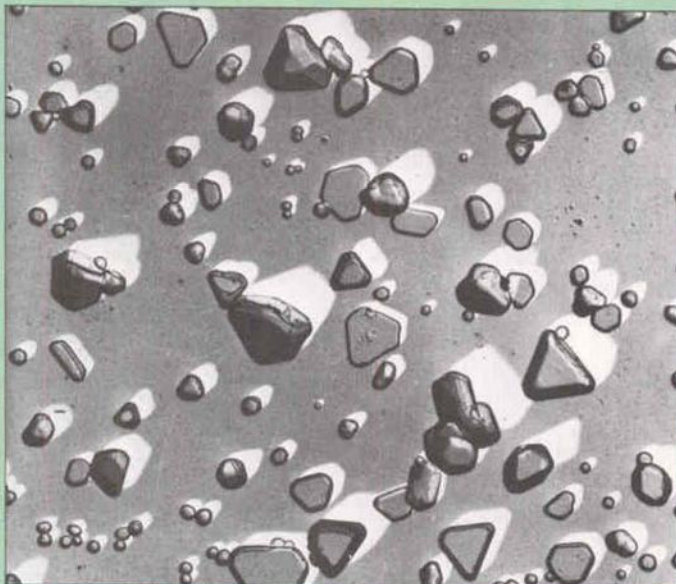
What is an emulsion?

The simplest type of emulsion is that used for black and white photography. *Emulsion* is really the wrong word, because the light sensitive layer of film or paper consists of minute crystals of silver compounds *suspended* in gelatin. For historical reasons it is called an emulsion, not a suspension.

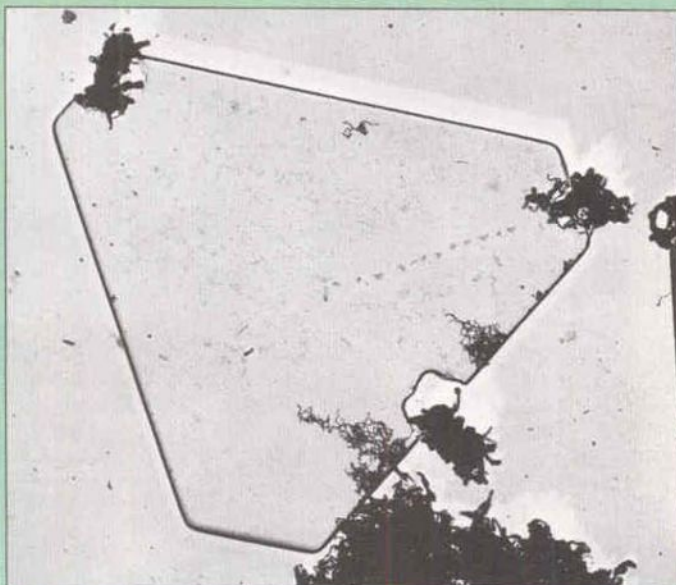
It is possible to make a simple emulsion in the kitchen sink. All that is needed is some common salt dissolved in a weak glue of warm cooking jelly.

If a solution of silver nitrate is stirred into this mixture, myriad tiny crystals of silver chloride are formed, turning the gelatin white like milk. The crystals are insoluble in water, so they separate or *precipitate* out. If the emulsion was made in a darkroom under a safelight, instead of in daylight, it could be coated on to paper, dried and used for printing.

The light sensitive compounds used in photographic materials are made by combining silver with chlorine, bromine and iodine. These three chemicals are called *halogens*, and the compounds they form when combined with silver are called *silver halides*. There is a fourth



Photograph courtesy of Ilford



Photograph courtesy of Kodak

Silver grains The top picture shows the different sized crystals of silver halide contained in an emulsion. The lower picture shows silver around a part-developed grain

silver halide, silver fluoride, but it is of no interest to photographers because it is soluble in water and would wash out of the gelatin layer. Of the three useful halides, silver bromide is the most sensitive to light and the most important constituent of any emulsion.

Development

If a piece of undeveloped film is left in a sunny window for a few minutes it will turn a slate grey. Light converts the silver bromide to very finely divided metallic silver. Bromine gas is liberated and this can be detected by its acrid smell.

In a camera, the exposures given to a film are not enough to produce instant visible silver. Instead, on each crystal that receives more than a certain amount of light, a few atoms of silver are freed. These collect at points on the crystal surface where there are impurities—such as silver sulphide—which have been formed during manufacture.

The images formed in a camera are invisible or *latent* images, and can be revealed only by treating the exposed film in a developer which continues the action of the light. Every crystal with one or more groups of silver atoms on its surface is quickly changed entirely to silver by the reducing agent in the developer.

If a developer is allowed to act for long enough it will reduce all the halide crystals to silver whether they have been exposed or not, but its action on exposed crystals is from 10 to 100 times as fast. In the normally brief development times of a few minutes the exposed areas of a film are blackened and most of the halide crystals are changed completely to silver. In the areas that have received little exposure only a few particles of silver are formed. There is thus a 'negative' image in which the lightest parts of the subject are recorded by the densest parts of the film and the dark parts appear almost transparent or clear.

Gelatin

The gelatin, in which the light sensitive crystals are embedded, has several things to do. It holds the silver halide crystals in place and keeps them evenly distributed on the paper or film backing. It swells in the developer by absorbing water and allows the chemicals to have free access to the halide grains. It also helps

development by increasing the rate at which exposed grains develop, while slowing down the unexposed ones.

Development must be stopped before the unexposed grains start to develop by rinsing the film or paper vigorously in water. It can be stopped even more quickly by using a very dilute solution of acetic acid—spirit vinegar—as a stop bath instead of water. This has the effect of neutralizing the alkali contained in every developer and the action stops almost at once. Developing agents, almost without exception, have to be in alkaline solution to work properly.

A stop bath has another important function—it prevents developer contaminating clean solutions.

Film development After exposure, silver bromide crystals in the emulsion are left covered with minute specks of silver (top). During development, each exposed grain is converted entirely to silver (middle). Fixation removes unexposed grains of silver bromide



Bernard Fallon

Fixation

After development there is a considerable quantity of silver halide left mixed with the silver image. If this was left on the film or print, it would slowly darken and eventually almost obliterate the image. The silver halides are not soluble in water so a fixing bath is used to convert them to freely soluble compounds. Some of these compounds diffuse out into the

Emulsion paint These two pictures were printed on to ordinary paper. The photographer first made it light sensitive by painting on a home-made emulsion

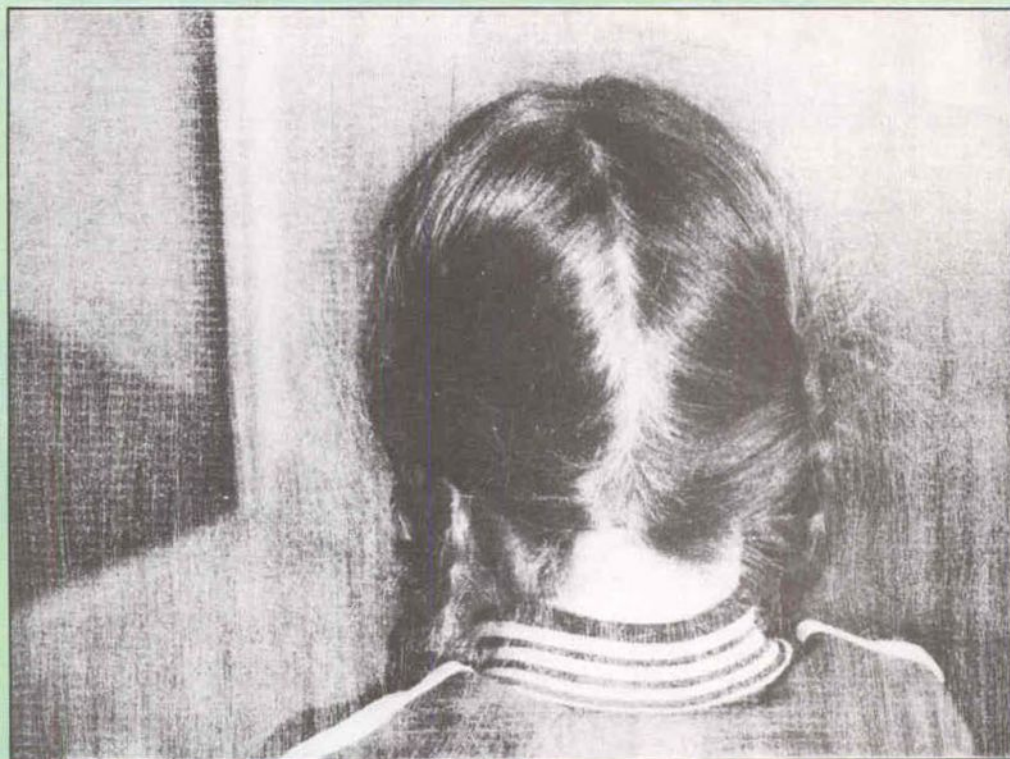
fixing bath, and it is the accumulation of silver salts in a fixer that limits its useful life, rather than exhaustion of the solution.

A final wash in running water must be given to all films and papers to remove soluble silver salts and also the fixing chemicals. Any silver salts left in an emulsion slowly darken in light if not removed and fixer eventually decomposes and attacks the silver image, turning it brown in patches.

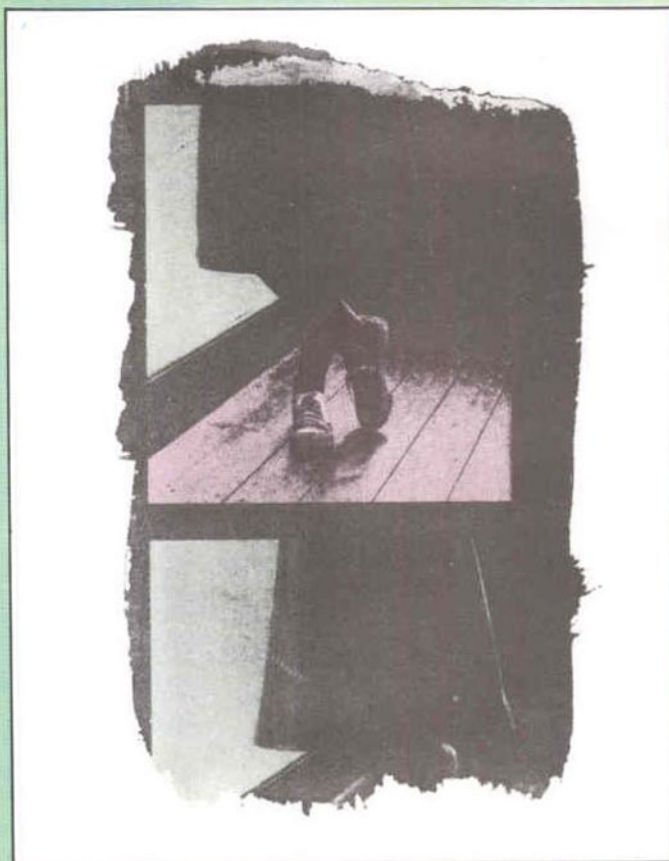
Commercial emulsions

Emulsions on films and papers are very different from the simple homemade silver chloride type described here.

For a film, the light sensitive compound is mainly silver bromide with traces of silver iodine. The method of precipitation of the halides and their subsequent heat treatment controls the speed and other properties of the material. A slow emulsion has very small halide crystals of fairly uniform size, and a fast one has bigger crystals of much more varied sizes. In a single emulsion the larger crystals or grains are the most sensitive to light.



Mari Mahr



Mari Mahr

Colour emulsions are silver halide emulsions just like those of monochrome materials. Additionally, most colour emulsions contain *colour couplers* which eventually form the coloured images making up the final picture. In this process, silver is produced, but it is not

required in the final image and so it is removed by converting it back to silver bromide and then fixing it in the normal way. A bleach-fix bath performs both operations in a single process. The final images consist only of minute dye particles suspended in gelatin.

Using Multigrade

Variable contrast paper can be used to produce top quality prints and is as simple to use as separately graded paper which it can replace, so keeping down your paper stocking costs

Most exposed films include black and white negatives of varying contrast, which usually require printing on papers of different contrast grades. Most prints can be made on grade 2 and grade 3 paper but occasionally you need other grades. Purchasing a complete range of grades of paper is expensive, but a practical alternative is to use a single variable contrast paper that enables you to deal effectively with all but the most troublesome negatives.

One of the most popular variable contrast papers is Ilfospeed Multigrade. Multigrade is physically similar to conventional resin coated (RC or PE) papers, such as Ilford's own Ilfospeed material, but you can alter its contrast range simply by adjusting the colour of the enlarger light source with the aid of filters. The paper is easy to process, needs a wash of only two minutes, and does not necessarily require a specialist dryer for a top quality finish. It is a medium weight paper available in either a gloss or pearl finish.

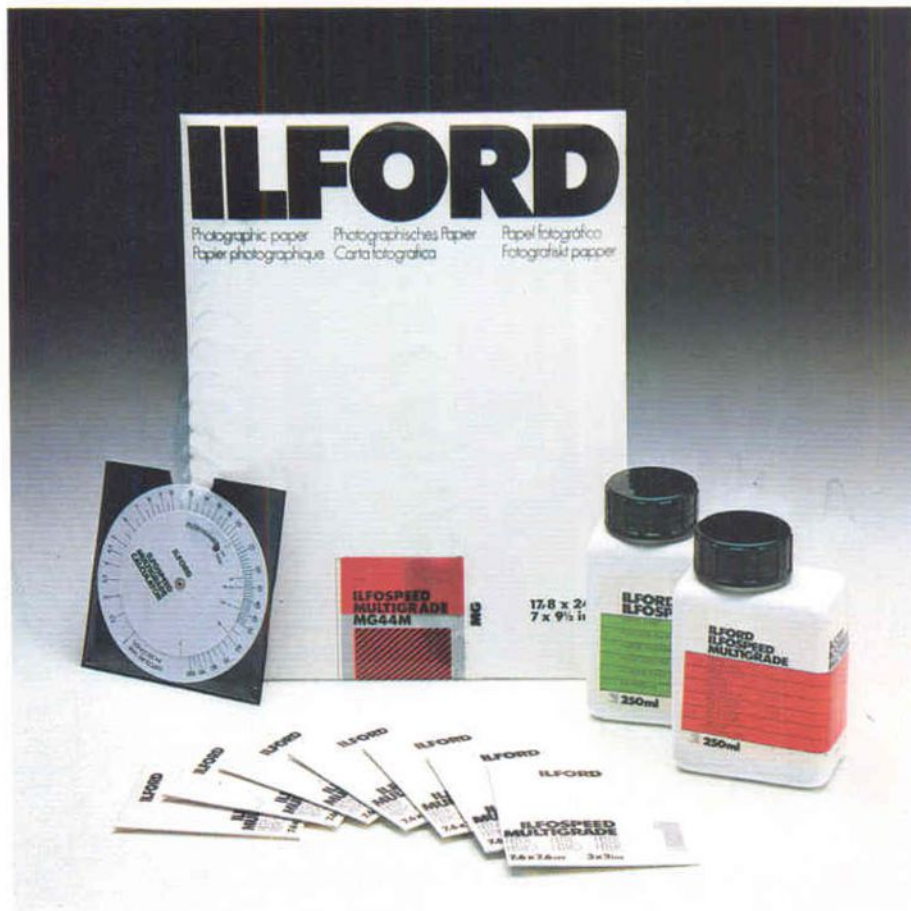
Paper properties

The emulsion of Multigrade paper consists of a mixture of blue sensitive and green sensitive silver halide crystals. The blue sensitive crystals provide the high contrast component of a print image, and the green sensitive crystals provide low contrast.

Used as a normal paper and exposed without any sort of filtration, Multigrade paper gives the same sort of result as grade 2, 'normal' paper. But by introducing coloured filters, it is possible to 'swing' contrast towards one or other of the contrast extremes.

A yellow filter absorbs blue light but transmits green so that more green light reaches the paper than normal and less blue light. When you make the exposure, therefore, more green sensitive crystals are affected than blue. The result is an image of lower than normal contrast.

A magenta filter, on the other hand, which absorbs green light but transmits blue, gives a print with more contrast than normal. By adjusting the strength of filtration, varying proportions of the blue sensitive and green sensitive crystals are used, and a range of print contrasts is possible. There are seven filters in the Multigrade range, two of which are yellow (numbered 1 and 2) and five that are magenta (numbered 3 to 7). The filters are made from polyester sheet, and must be handled carefully to prevent undue scratching as this may affect image quality.



Victor Watts

Trial pack The Ilfospeed Multigrade Discovery Kit contains everything you need to make 25 prints. The calculator and filters can be retained for further use



Print filters The filters are available in different forms and sizes. The calculator enables you to work out exposure times



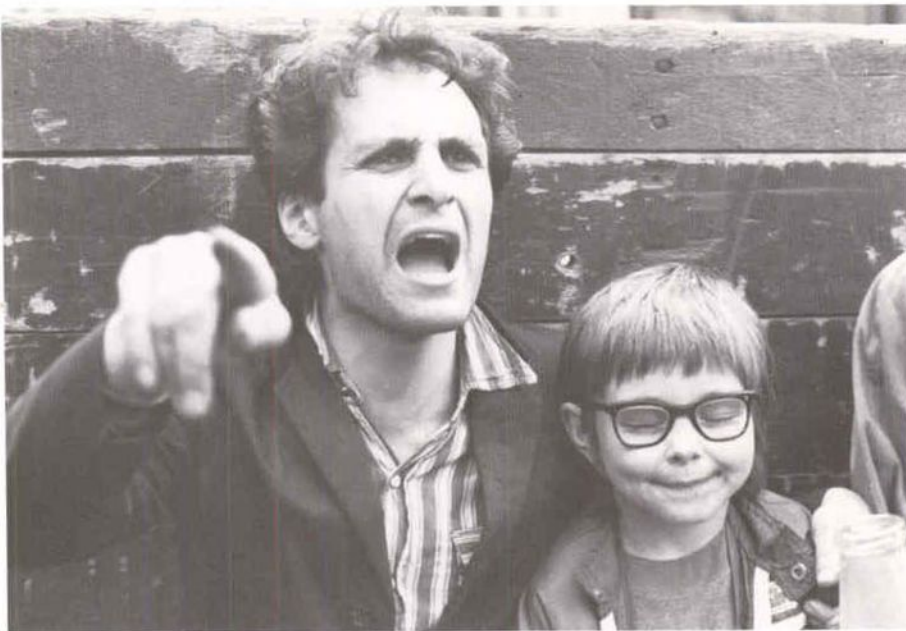
Filter above negative You can place the filter above the negative, although dust and scratches on the filter will show

Enlarger supplied by Durst (UK) Ltd

Using Multigrade

Multigrade is designed to be used in enlargers fitted with a tungsten light source. If another form of enlarger illumination is used, the nature of the light source may change the paper contrast range. Normally, this is easily corrected. A light source that is too blue, for instance, can be balanced by adding a yellow filter between the light source and the negative. If the contrast grades obtained do not seem to tally with the maker's claims, test and calibrate the exact filtration for your own enlarger. This test need only be performed once, unless the light source is changed or the lamp is renewed.

Ilfospeed Multigrade paper is not sensitive to red or to orange light and can be handled under the same safelight conditions as most other black and white printing papers. A light brown safelight is recommended by the makers, however. You can easily test your safelight using the method outlined on page 311.



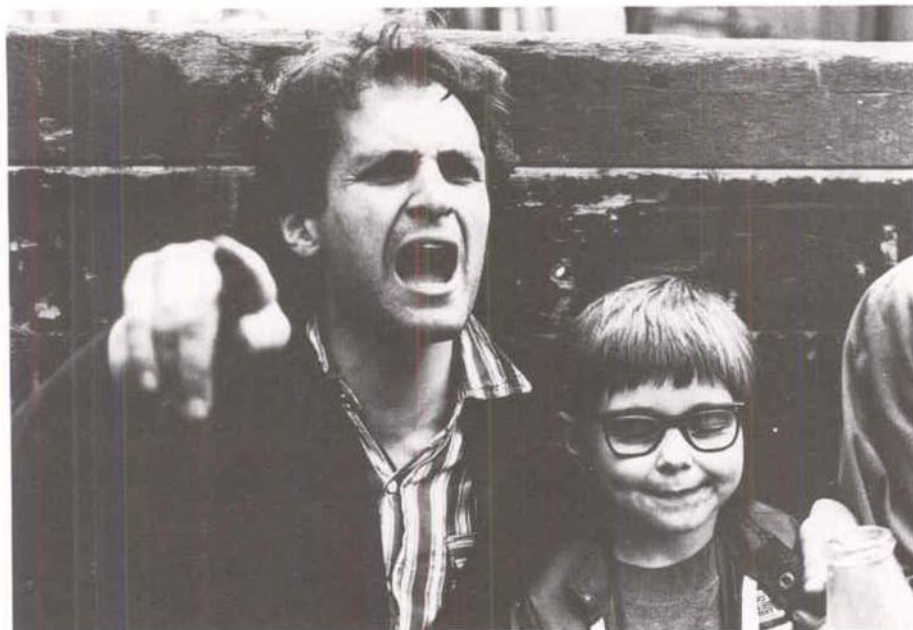
Peter Laishley

Contrast change Even 'normal' negatives can sometimes benefit from the extra punch of printing on to a higher contrast paper—quickly done if you use Multigrade

Exposing Multigrade

Multigrade printing filters are available in various forms. If your enlarger has no filter drawer for colour printing, you can buy a set of seven mounted filters to fit below the lens in a special holder that clamps round the enlarger lens. Alternatively, you may wish to use the filters above the lens—particularly if your enlarger does have a filter drawer. Individual, unmounted filter squares, ranging in size from 76 mm to 152 mm, can be cut to size and placed either directly on top of the lens (which is inconvenient), or within a filter carrier at some point between the negative and light source. They can be sandwiched between squares of heat-absorbing or optically flat glass, if necessary.

Peter Laishley



Close-up lenses loaned by ALCO and Polysales



Filter above lens A better position for the filter is above the lens, but access may prove difficult on some enlargers



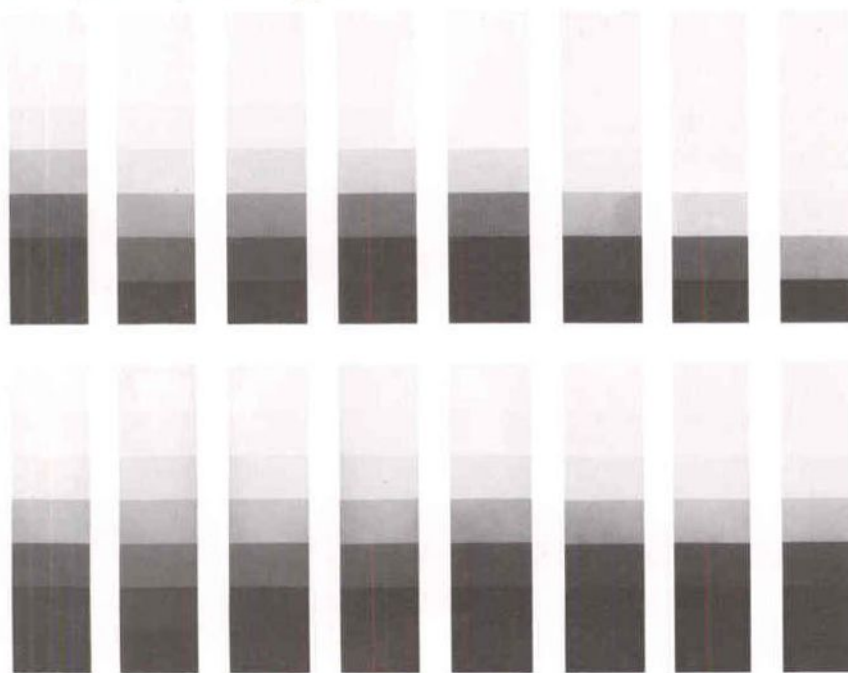
Filter beneath lens You can obtain a special set of filters which slip into a cradle clamped to the lens



Using a filter drawer This is the best position for the printing filter as dust and scratches do not affect image quality

Jon Bouchier

Different printing filters



Different printing filters Each strip represents a range of tones such as you can expect to find in a good negative. These strips are obtained by printing a step wedge 'negative'. The top set of eight strips shows the effect of printing through the different filters without adjusting exposure. The lower set shows strips printed through different filters, but with adjustments made to printing exposure in order to compensate for the varying density of the filters. This set also shows the effect on print contrast of the various filters. Contrast changes are very subtle with adjacent filters, but this is useful for fine tuning print image quality

The less dense filters can be left in position during focusing and composition but the deep magentas restrict the light too much and must be removed between prints. Be particularly careful when replacing the filter not to knock the enlarger out of focus.

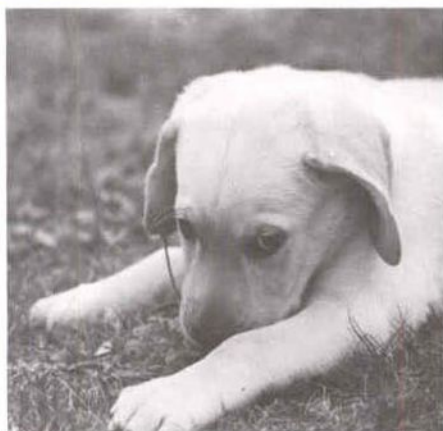
Multigrade paper is slightly faster than conventional printing papers when it is used without a filter, but the difference is not significant unless you change from a graded paper to Multigrade, or back, during a printing session. Exposure times for one are unlikely to be correct for the other.

The routine for making prints with Multigrade paper is the same as printing on graded paper. Set the enlarger up in the normal way and make a test print—but with no filter to start with. Establish a time which gives the best print.

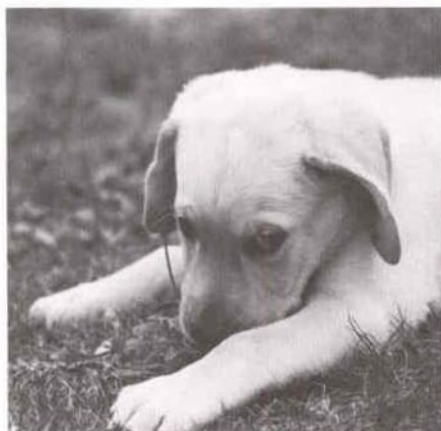
You can now decide whether to adjust contrast. If this is necessary, choose a filter—1 or 2 for a softer image, 3 or higher for a harder image. The eight contrast steps cover a paper grade range from 0 to 4 when compared to conventional Ilford paper.

Exposure time varies according to the filter being used. A 7 filter is much denser than a 3 filter, for instance, and absorbs more light. Longer exposures will therefore be needed.

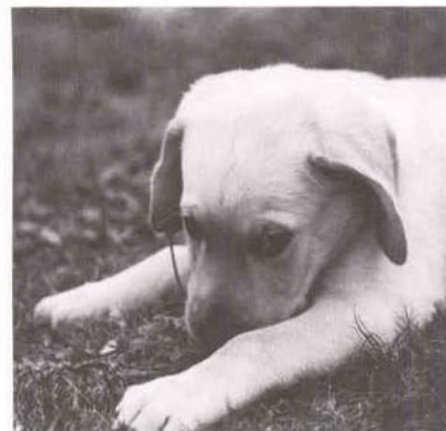
Ilford provide a conventional circular plastic calculator that enables you to determine the exposure for every filter once you have established the correct time for a single filter. There is a



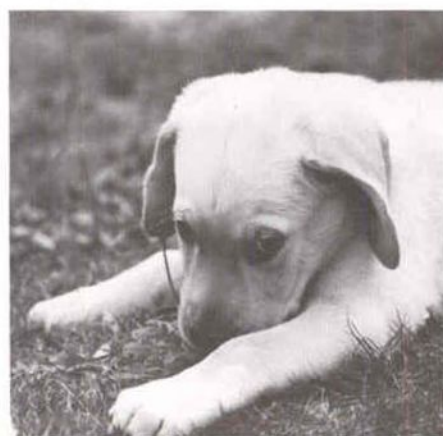
No. 1 filter—10 seconds exposure



No. 2 filter—8 seconds exposure



No. 3 filter—7+ seconds exposure



Without filter—5 seconds exposure

Multigrade contrast steps

Variable contrast paper, typically Multigrade, has eight contrast steps compared to five grades (0 to 4) of comparable graded paper. As a result, Multigrade removes the need for a choice of a specific grade of paper. This can help to cut down the waste—which you may get when using graded paper—of prints which are 'almost right' but nevertheless need reprinting on the next grade for best results.

Providing your initial choice of the printing filter is not wildly incorrect, there may be little point repeating a print using the next number printing filter. From the series of pictures above,

you can see that there is little apparent difference between adjacent prints, but significant difference between alternate ones.

If your print exposure and processing techniques are consistent, you may find that the part-grade contrast steps offered by Multigrade offer very precise control over image contrast. This is a small but nevertheless valuable feature which enables you to make the most of variable contrast paper, but one that is easily disguised by the hit-or-miss approach associated with inconsistent print processing. Multigrade must be processed and dried for the best image quality.

reference position for 'no filter' which is likely to be the starting point for many prints. When you have found the correct exposure time from your test print, simply set this against the 'no filter' index. You can then read off the correct exposures for any of the seven filters. The calculator can also be used to determine the new time when changing from one type of filter to another.

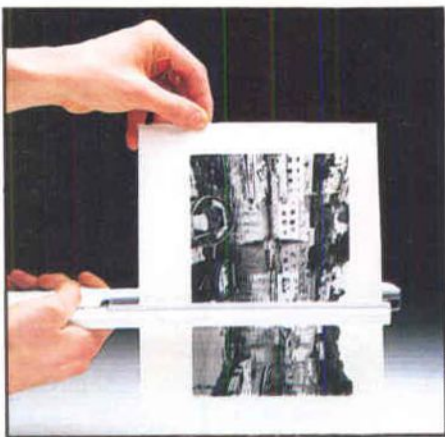
Choosing the grade

When testing Multigrade paper and filtration, use a negative of good quality that you have already printed satisfactorily on normal grade bromide or Ilfospeed paper. The normal print can then provide a reference point. You can determine whether an increase or a decrease in contrast is required using Multigrade, with or without the filters.

If the original negative seems slightly flat and its contrast needs increasing, a number 5 filter can be used to boost the contrast slightly (and used as the starting point for any future negatives having similar characteristics).

Place the negative in the negative carrier, set the enlarger head for the required print size and focus the negative. Then stop down the lens to your favourite printing aperture. Using the selected filter, make a second test print of different exposures. Process the print and make an assessment.

Contrast is often dictated by the subject, and having decided on what you require, adjust the filtration accordingly.



Victor Watts

Processing Multigrade is processed in the same way and just as quickly as conventional Ilfospeed. A squeegee wiper is useful as a drying aid

If the best exposure is too contrasty, change to a lower number filter. If it is too soft and lacking contrast, use an even higher number filter. If the test print has the correct density but the wrong contrast, set the filter number you have used against the exposure time. Any corresponding time or alteration in filtration can then be read off.

Processing Multigrade

Ilfospeed Multigrade is developed in a similar way to ordinary RC or Ilfospeed paper but you should *not* use Ilfospeed developer. A normal print developer

giving a development time of two minutes or the special Ilfospeed Multigrade developer for faster developing both give good results.

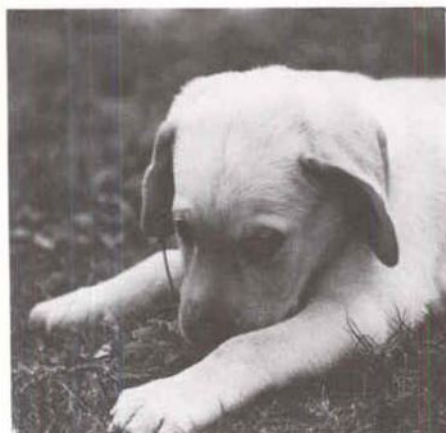
Multigrade developer is supplied as a liquid concentrate which is diluted 1:9 with water before use. Dish development is carried out at 20°C. The image normally begins to appear after about ten seconds and development should be complete after one minute. The minimum recommended time for developing paper in these chemicals is 35 seconds.

The colour of the print image varies slightly with the developer used. Multigrade developer gives a good neutral black whereas normal print developers tend to give a slightly 'blueish' black.

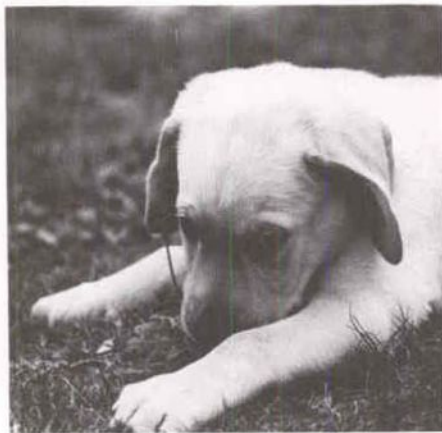
After development, rinse the print in a stop bath before transferring the print to a bath of non-hardening fixer. Any brand can be used but fast acting Ilfospeed fixer, like several others, will fix a print in 30 seconds. With such a brief fixing time, it is essential to agitate the print continuously to ensure that it is fully and completely fixed.

If the print is fixed in a solution containing acid hardener the washing time needs to be increased to 20-30 minutes, whereas a two minute wash in running water is adequate if a fixer such as Ilfospeed is used.

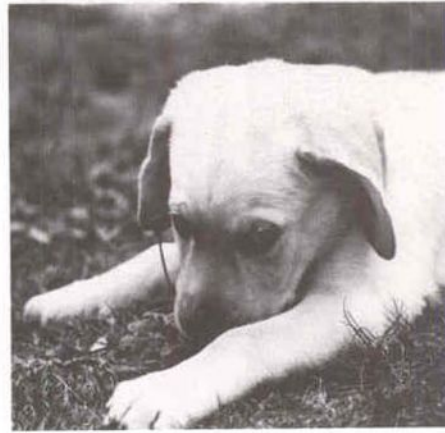
Ilford Multigrade paper can be dried with a hair dryer or fan heater, but take care not to overheat the paper since the print surface may buckle and distort. Prints can also be hung up to dry in a



No. 4 filter—8 seconds exposure



No. 5 filter—10 seconds exposure



No. 6 filter—13 seconds exposure

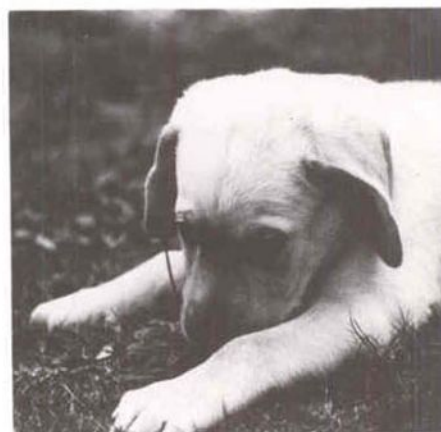
Paper speed

The effective speed of Multigrade changes according to the printing filter used. For normal use, a special calculator provides the most convenient method of determining print exposure times. To use this you must first have one 'known' time—easily obtained from a test strip produced with or without a filter in place. This exposure time is aligned with the appropriate filter index. The exposure times for all other filters can then be read off at a glance. The paper is fastest when no filter is used, slowest (requiring longest exposures) when the deepest magenta filter (number 7) is used. Numerical values for the

various Multigrade filters are based on the ANSI system:

Filter:	none	1, 5	2, 3, 4	6	7
Speed:	400	200	250	160	80

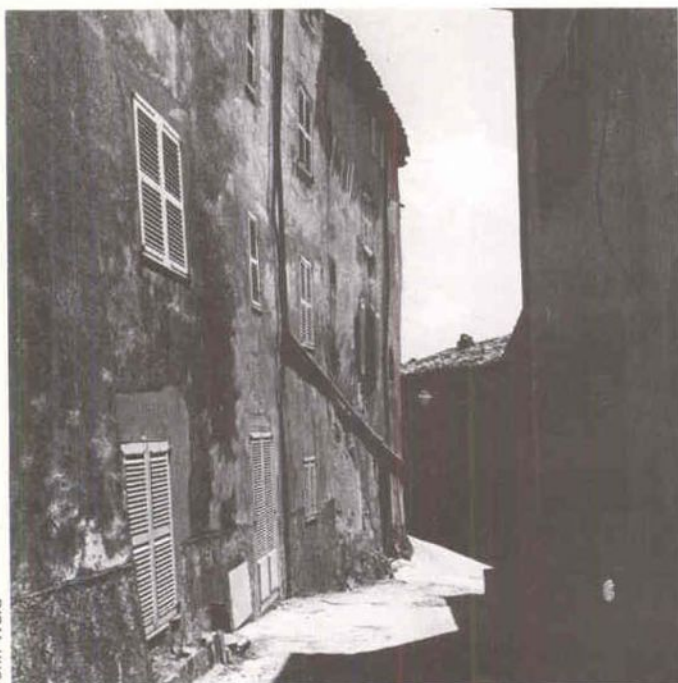
New exposure times can be calculated by multiplying a known time by the speed of the filter used to obtain this print, and by dividing this figure by the speed of the new filter. For example, if a number 5 filter is used and the print is exposed for 20 seconds, a change to a softer filter (4, 3 or 2) means a new exposure time of $20 \times 200 \div 250$, which equals 16 seconds



No. 7 filter—25 seconds exposure

John Ward

John Ward

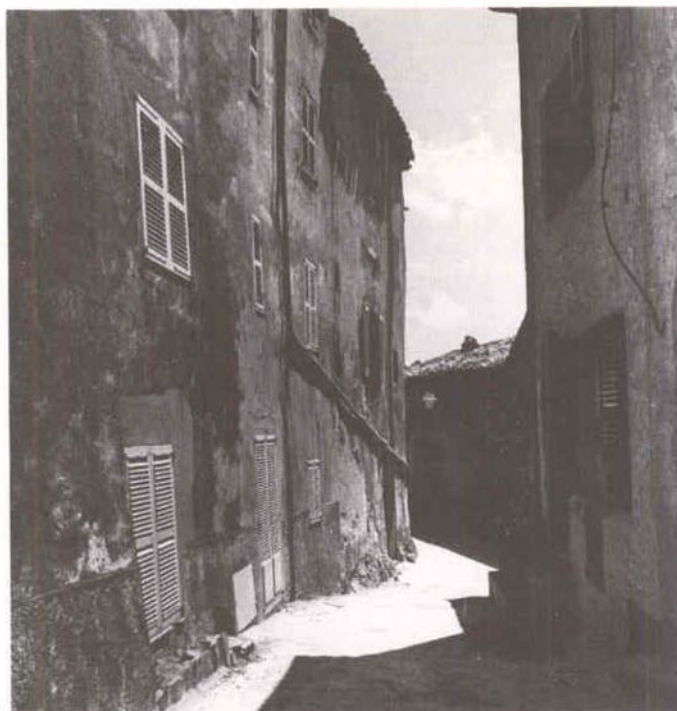


drying cabinet, or left to dry naturally. In all cases it is best to wipe off the surplus water first with a small rubber squeegee, or a purpose-made wiper. Otherwise, carefully blot the two sides using blotting paper, or fluffless absorbent paper or cloth towelling. Hang the prints in a warm room—they should dry out after about 20 minutes. Never attempt to dry or glaze Multigrade or other RC papers on heated glazers because the polythene coating will soften, melt and stick.

Once you are familiar with the characteristics of Multigrade, several sophisticated printing techniques are possible. You can, for instance, vary the contrast range within a single print. With practice you can do this by exposing the negative twice—printing through two filters (1 and 7) and changing the amount of exposure through each. This is normally achieved by exposing the whole image through one filter and, while shading, exposing the rest through the second filter. If several prints have to be made from one negative, it is best to use a printing jig for the shading step.

Contrast control

By selective use of different printing filters, combined with the techniques of dodging, it is possible to alter print contrast within the area of a single print. The print at top left is the best 'straight' print, using filter 4. However, by printing the whole image first through a number 7 filter, you can boost the area of shadow in the large shot. This area is then shielded for a 'softening' effect through filter 1 for a pretested proportion of the overall exposure. Detail also improves



John Ward

If your enlarger has a colour head

If you already do your own colour printing and possess a set of filters for this, you can use these to print Multigrade. Similarly, if you have a colour head on your enlarger (which permits direct and instant dialling-in of the required filter values in colour printing) this may be used to obtain a continuously variable range of contrasts from Multigrade. In either case, you do not have to buy the special Multigrade filter set.

To use colour printing (CP) filters you may have to make up a 'filter pack' which consists of a sandwich of two or more individual filters. For Multigrade printing, the strength of a particular colour can be

built up by adding together yellow or magenta CP filters of different values. A starting point for your own tests (which you must make to correct for your enlarger system) can be established from the figures provided in the table.

If you use a colour head, you may have difficulty obtaining the highest contrast levels possible with Multigrade. In this case you have to supplement the restricted magenta filtration. The amount of magenta filtration required is considerable to make any appreciable difference in contrast, and magenta values of this magnitude simply are not required in the course of colour printing.

Print contrast required*	Multigrade filter number	Colour printing filter**	
		yellow	magenta
very low	1	45	0
low	2	30	0
slightly low	3	0	15
normal	4	0	50
slightly high	5	0	75
high	6	0	100
very high	7	0	175

*The contrast range of Multigrade slightly exceeds the range covered by grades 0 to 4 of conventional Ilfospeed. For extremely thin negatives, or for high contrast, use higher contrast paper.

**Kodak values. Use these as a starting point for your experiments



Improve your technique

Lighting and the weather

Many photographers put their cameras away when the sun stops shining or the temperature falls. But all types of weather offer excellent opportunities for taking interesting shots



Wherever you live, the weather is rarely the same for very long. Sooner or later, the wind changes direction and blows away the clouds or brings the rain, if only briefly. Just as the quality of light changes through the day, so changes in the weather throw a different light on the landscape. The changing moods, the changing shadows and the changing colours offer tremendous creative scope. But to exploit it properly you must be able to handle the technical problems that each type of weather presents.

Traditionally, brilliant sunny days have been the time to take photographs. With the sun shining over your shoulder, the subject is strongly and brightly illuminated. Strong lighting like this used to be essential for the proper recording of the

Evening rain *A distant shower at sunset gives unusual lighting*

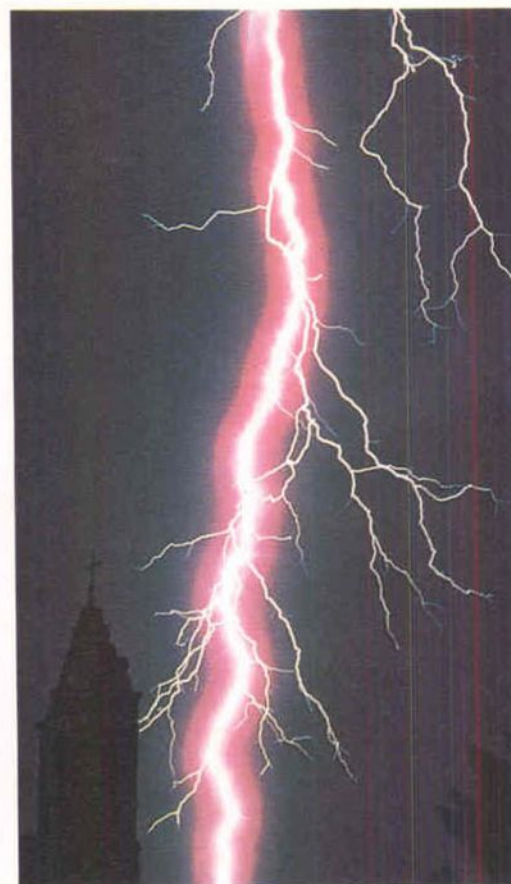
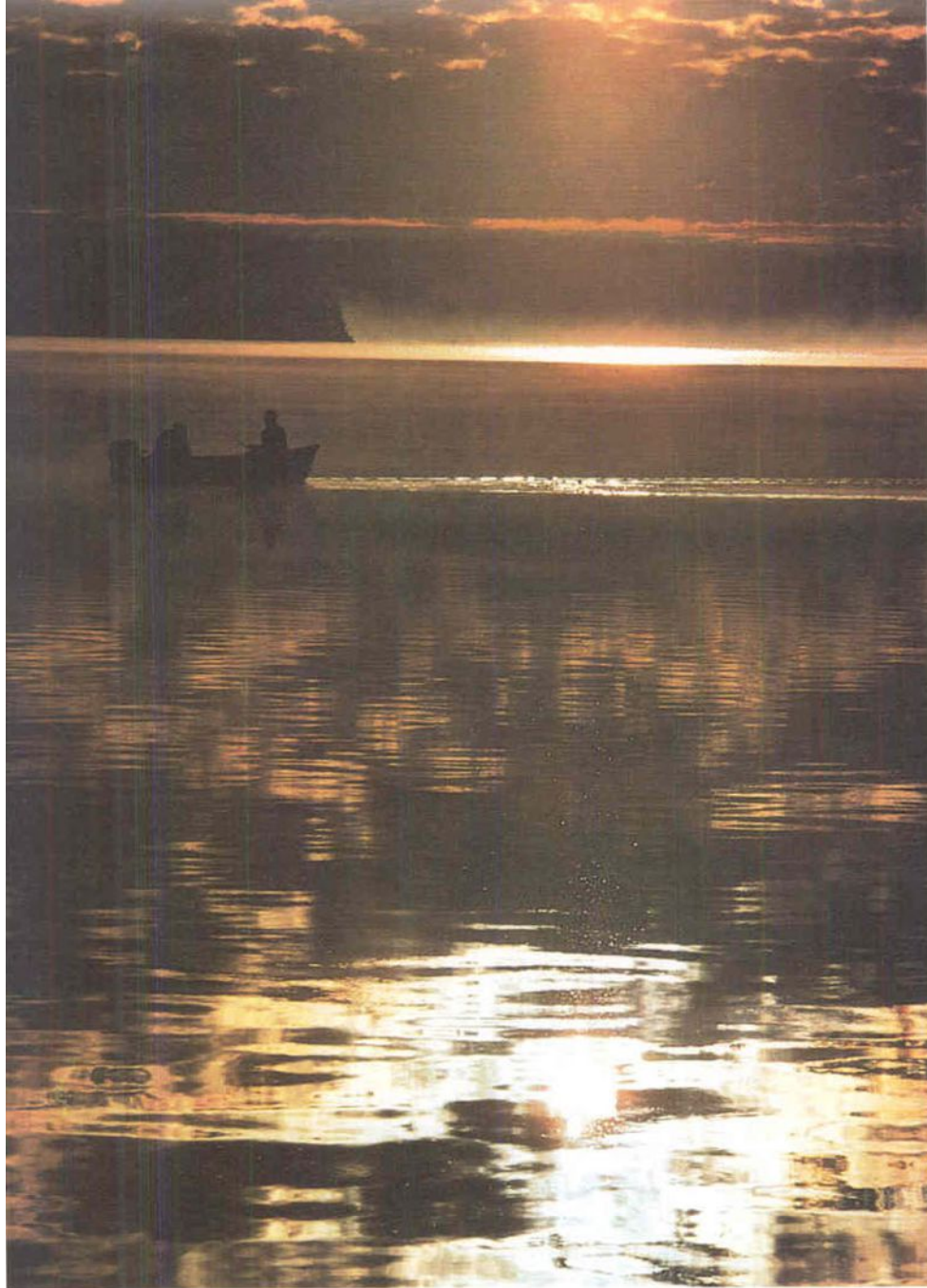
image, but with the development of increasingly versatile film and equipment, pictures can be taken under virtually any light. In fact, strong sunlight creates its own problems and for high quality results demands special techniques—these are explained in a later article (see also page 289).

Clouds

When clouds begin to appear in the sky, but the sun continues to shine brightly, it is difficult to see any difference in the quality of the light. Yet the light that falls on the ground is subtly modified by the presence of clouds and it is sometimes

worth taking this into account. Clouds scatter the light passing through the atmosphere. This reduces the total light reaching the ground minimally but sometimes significantly. More importantly, clouds help to diffuse the light, reducing its intensity slightly and throwing it into places that were in shadow before. In pictures where shadow detail is important, this can be valuable. And if you want to shoot portraits in strong sunlight, it may well be worth waiting until the sky is just a little cloudy. If, however, the sun goes behind a cloud, the effects on the quality of light are profound.

When the sun goes in behind a cloud, the overall colour temperature—that is the amount of blue light in the atmosphere—rises dramatically. The colour



Lightning With a camera placed on a tripod, and a little luck, it is possible to record lightning by making a time exposure

Lake scene The moment when the sun breaks through clouds to illuminate even part of the scene often produces spectacular and atmospheric pictures

Cityscape Clear skies with little cloud (right) can produce a variety of lighting conditions. Evening light gives warm hues to buildings

John de Visser

temperature is about 5500K on a totally cloudless day, but when the sun is temporarily hidden behind a cloud, much of the light comes from blue sky and the colour temperature can be over 6500K. Unless you compensate for this, colour photographs will have a strong blue cast.

One solution is to wait for the sun to re-emerge, but this is not always possible, nor even desirable. The opportunity for the photograph may also evaporate as you wait. On the other hand, you may want to take advantage of the more diffuse lighting available when the sun is behind the clouds. In either case you will need a correction filter for colour film.

Because your eyes do not compensate fully for the change, full correction with a strong amber filter of the 81 series (81B or 81C) usually looks unnatural. Unfortunately it is difficult to generalize because many factors influence colour temperature as well as the cloud cover. For example, a high proportion of the light is blue even on cloudy days, so the colour

temperature in the shadow of a building or beneath a tree could be very high. This sort of situation would probably call for a combination of 81A and the stronger 81B. Normally, though, one is adequate.

When the wind is very strong, the clouds move very quickly and deep shadow can, as the clouds obscure the sun, alternate rapidly with brilliant sunshine. When the light is changing so fast, it is usually best to take an average meter reading from the scene and make a number of exposures.

When the sky has both clear blue areas and clouds, its pictorial impact can be increased by using filters. Polarizing filters will increase the contrast between blue sky and clouds with colour film, while yellow, orange and red filters will have a similar effect on black and white pictures. Graduated filters that fade from grey, or a colour, into clear can also be particularly useful. These darken or tint a cloudy sky dramatically while leaving the landscape unaffected.



Overcast skies

A low level cloud cover produces even, sombre lighting and increases colour temperature slightly. In such conditions you will need an 81 series warming filter to compensate when using colour film, but an 81A should, generally, give adequate correction.

Everywhere colour contrast drops, but the effect is particularly noticeable in cities. Exposure settings that are correct for street scenes will generally result in washed-out, bleached looking skies with no visual interest. Unfortunately, there is

no simple way of making up for this deficiency and the best solution is to choose your subjects accordingly. Make cloudy days an opportunity for photographing subjects close up and avoid including any sky. Many of these subjects may positively benefit from the soft lighting and the extra light in shadow areas. By underexposing by half a stop you may be able to retain some of the intensity of the richer colours if you are using colour slide film. With black and white negative film, however, you should overexpose slightly—about half a stop.

Rainy days

Lighting conditions when rain is falling are often similar to those under a heavy overcast. The light is bluer than it looks to the naked eye, and frequently very dim. It is tempting to use a high speed 400 ASA(ISO) film so that you can use relatively high shutter speeds and narrow apertures for good depth of field. However, when shooting in colour, you really need a slow film to make the most of the weak colours and the generally low contrast. Using low speed film, of course, means that a tripod is an essential



Nick Holland



Richard Newton/Selections

Tropical rain The diffuse light during heavy downpours illuminates subjects from all sides. Even under an umbrella the woman's face is well lit

Fog bank From a distance, low fog can have a remarkable solidity. Take your exposure reading from the rest of the landscape rather than from the fog

piece of equipment if you want to use a narrow aperture to retain reasonable depth of field.

Rainy days also call for colour correction with colour film. But be careful not to overdo it—too much correction can destroy the mood of a colour picture. Although a properly colour balanced picture theoretically requires an 81C correction filter when the sky is heavily overcast, less complete correction will usually give satisfactory colours and at the same time retain the feel of the overcast conditions.

An exception to the generally dim lighting conditions provided by rain clouds is found when the rain is falling from medium level cumulus clouds. These often produce fleeting showers that quickly come and go. Rain and sunshine may alternate very quickly under such conditions, and the contrast between a sunlit foreground and grey rain clouds can give impressive pictures. But correct exposure is not always easy.

There is no hard and fast rule, but probably the best approach is to expose for the sky, and allow foreground highlights to burn out.

Lightning is well worth photographing from a safe distance but a tripod is essential. At night it is possible to capture the image of several flashes of lightning by using a time exposure with the camera set on a tripod. For safety and comfort, work from a sheltered position away from high ground. Point your camera towards the storm and set the shutter speed dial to B. With 100 ASA film you need

an exposure of about 20 seconds at $f/16$, using a cable release to avoid shaking the camera. With luck you can record several flashes on film during the period that the shutter is open.

Wind

High winds are often accompanied by generally poor lighting conditions, with low light levels that require slow shutter speeds. Even with a strong, heavy tripod held down by your own body weight, it can be difficult to obtain sharp photographs in really strong winds. Yet the

changing light conditions with clouds rapidly scudding across the sky can produce dramatic photographs of landscapes and similar scenes. The best solution is to use a heavy tripod and wait for the strongest gusts to subside.

Slow shutter speeds can help to convey the effects of wind on your subject. Blurred leaves and branches can give powerful impression of the wind, but you must make sure that normally immovable objects, like heavy tree trunks, are sharp.

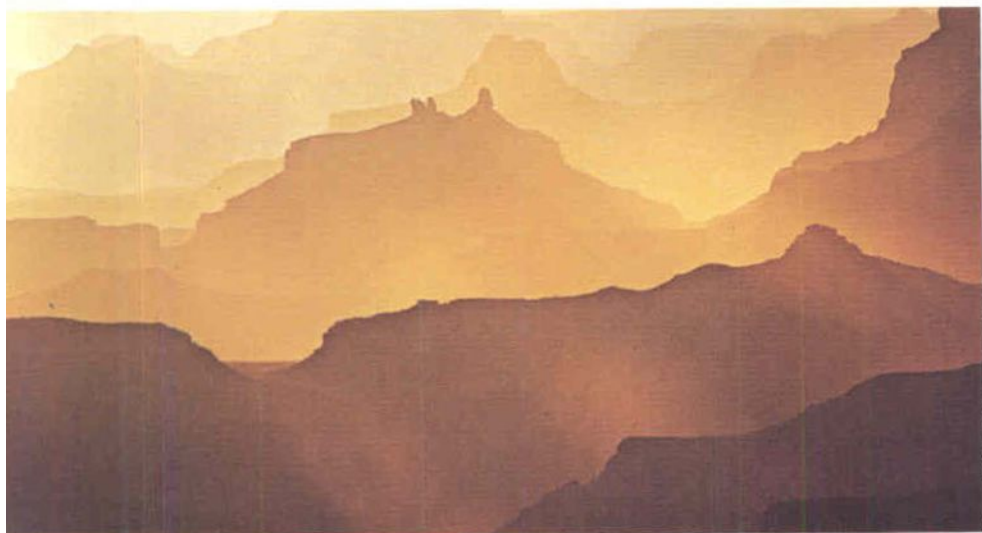
Snow

There is more to snow and ice than traditional Christmas card scenes. Grey snow-bearing clouds, for instance, can produce striking lighting effects. With an overcast sky, freshly fallen snow produces very soft, shadowless lighting and still, tranquil landscapes.

Distant hills *Morning mist lying in hills and valleys is accentuated by a telephoto lens, giving a moody softness to this landscape*

Sunlit trees *A shaft of sunlight shining through clouds (right) gives these trees prominence in the scene. Work fast to capture such moments*

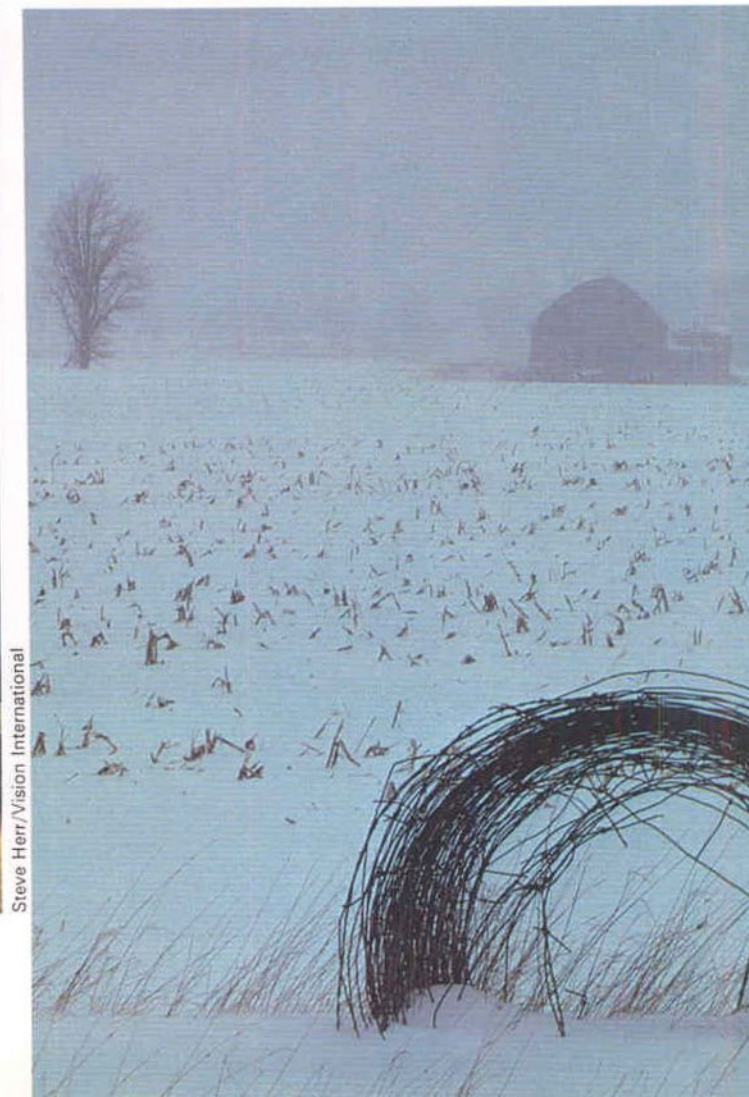
Snowscape *Under clear skies, snow scenes may appear an unexpected blue. The white of the snow-covered ground shows shadows in their true colours*



Dennis Stock/Magnum Photos



Country road *Dark rain clouds make a striking background to a sunlit road. No filtration is necessary for such a scene*



Steve Herr/Vision International

Exposures in snowy conditions are best measured by close-up readings or by incident readings taken with a separate hand-held exposure meter. An overall exposure reading from the entire scene will generally give underexposed results, since the meter will be misled by a large area of white snow.

Under an overcast sky, snow-covered fields seem brighter than the clouds above. This is an illusion, but you can artificially create the effect by fitting a graduated grey filter to your camera to darken the sky. The cloud cover over snowy landscapes is usually very pale and blank-looking, and any devices that can add interest to an otherwise dreary expanse of sky are worth using—graduated colour filters for example.

Contrast in snow covered landscapes can be exceptionally low, because the ground acts as a reflector to fill in shadows from below. Low humidity after snowfall usually means crisp, clear visibility. The scattering of light from many directions by snow and clouds means that subject detail will be clearly visible.

Nevertheless, snow scenes often turn out very blue on colour films, particularly if the subject is not lit by direct sunlight. When photographing people, an 81 series filter is needed to warm up skin tones, particularly on cloudy days. An 81B filter, for example, should give natural skin tones under such conditions without spoiling the mood of the scene.

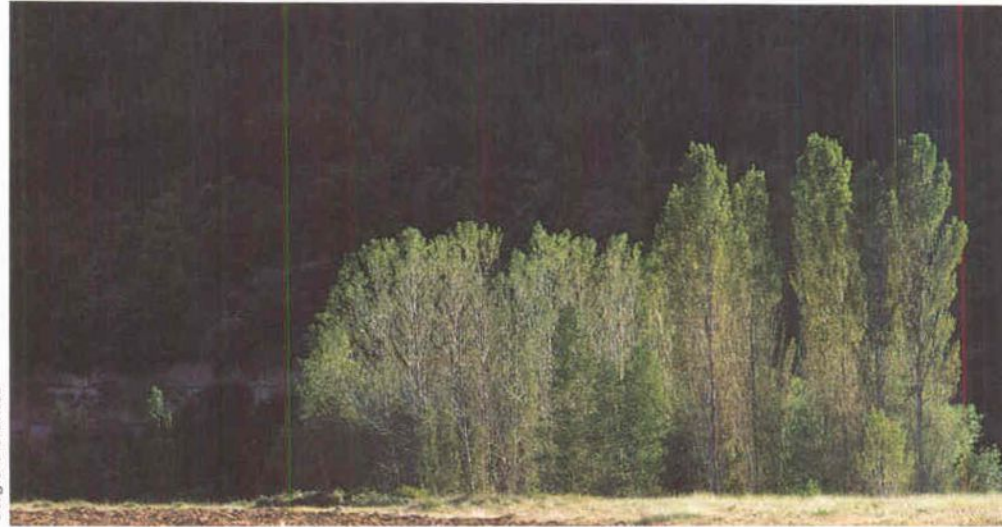
Mist and fog

Mist and fog offer tremendous scope for poignant, atmospheric pictures, but need careful handling. Although mist and fog reduce the overall level of illumination it is the change in the quality of light that is significant.

Colours become desaturated and pastel in mist, and the range of contrast is reduced. If you are using black and white film, you should not try to restore contrast by underexposing and over developing your film, since this will destroy the mood of the picture. Use a fast film

for greater flexibility. Coarse grain effects can add character to fog scenes.

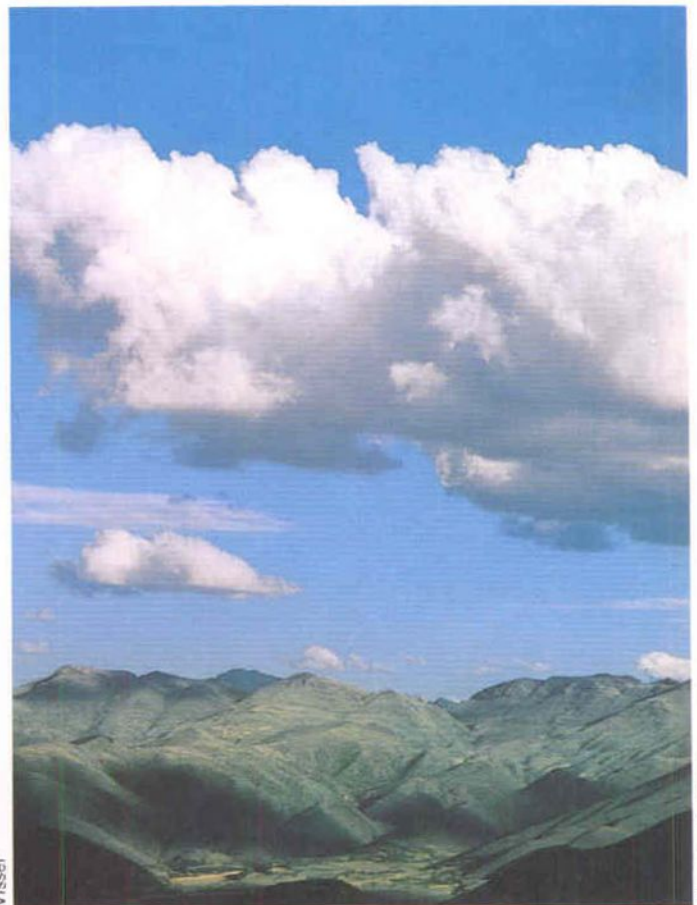
With negative films, base your exposure on a reading from the darkest part of the scene: with slide films take a reading from a middle grey tone so that the fog reproduces light. Remember that if you take meter readings close to your subject and then retreat to take your picture, exposures may be wrong. This is because the mist cuts out some of the light between camera and subject. With distant subjects, this can be important. To be safe, bracket your exposures.



Sergio Dorantes



John de Visser

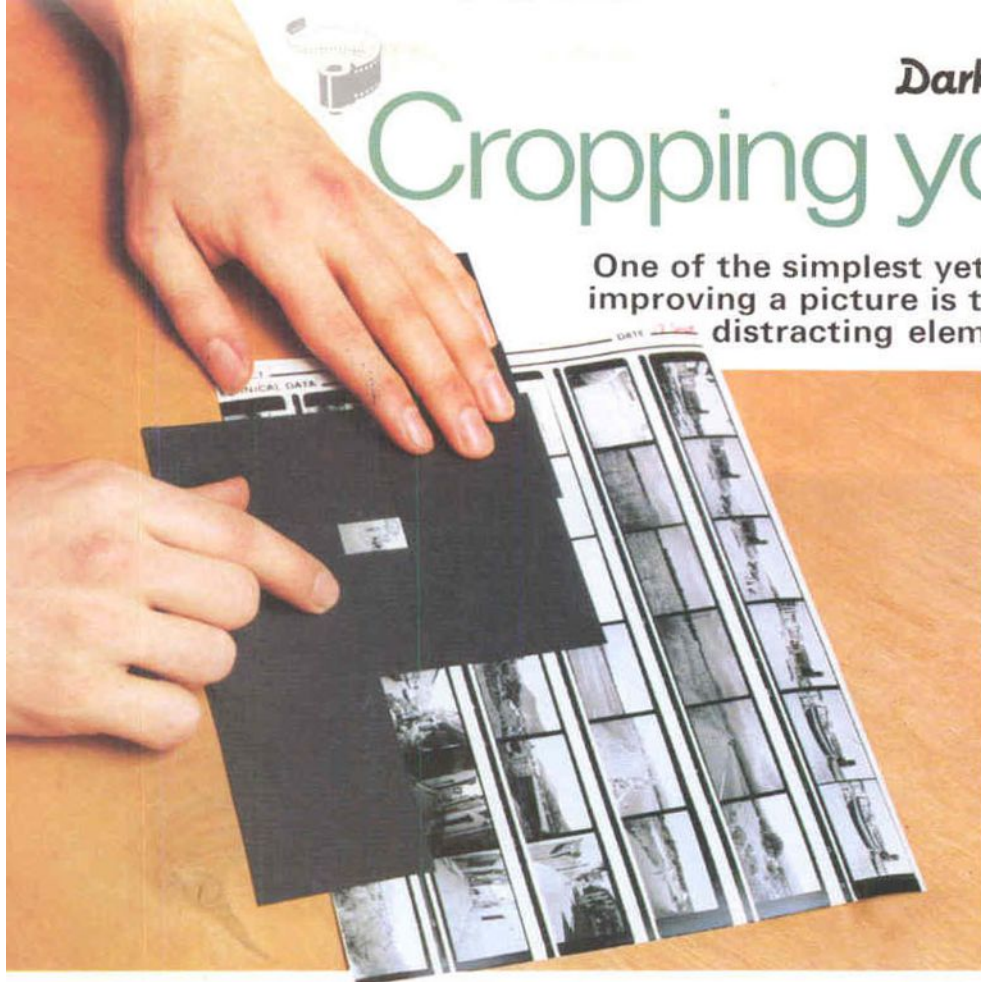


Timothy Boddow

Summer landscape Clouds cast a rapidly changing pattern of shadows on the ground on a sunny but windy day

Cropping your prints

One of the simplest yet most effective ways of improving a picture is to remove unwanted and distracting elements by cropping

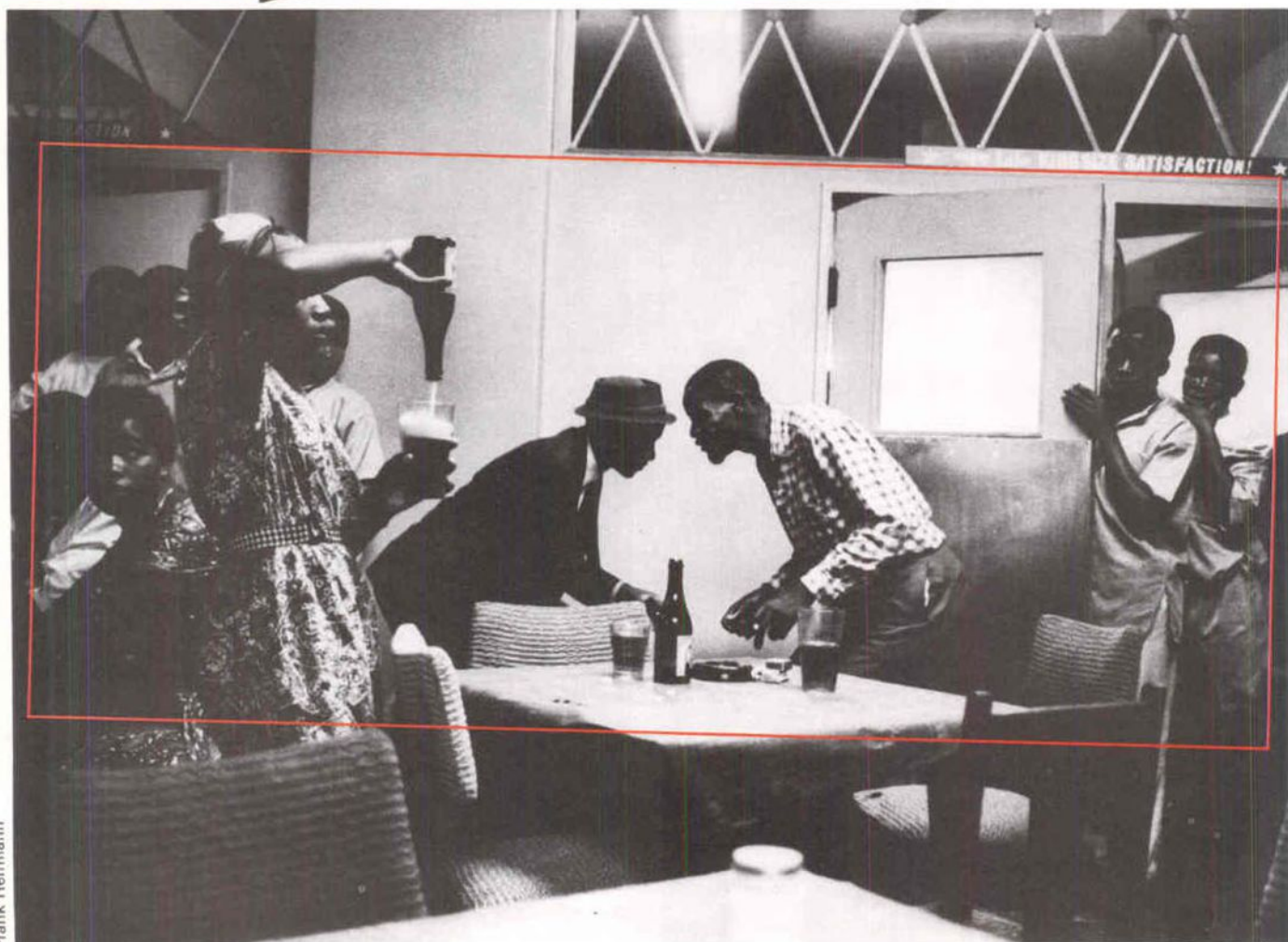


Tight framing of the subject has a tremendous effect on the impact of a photograph. Quite often, moving in close so that the subject fills the frame can make all the difference between a mediocre picture and a winner. Yet there are many occasions when you cannot frame up perfectly in the viewfinder. Perhaps you cannot get any closer to the subject. Perhaps you cannot get the right angle to exclude unwanted background detail. Perhaps you did not even have time to scan the viewfinder for distractions. Whatever the reason, you may yet be able to achieve the impact you hoped for by *cropping* during printing.

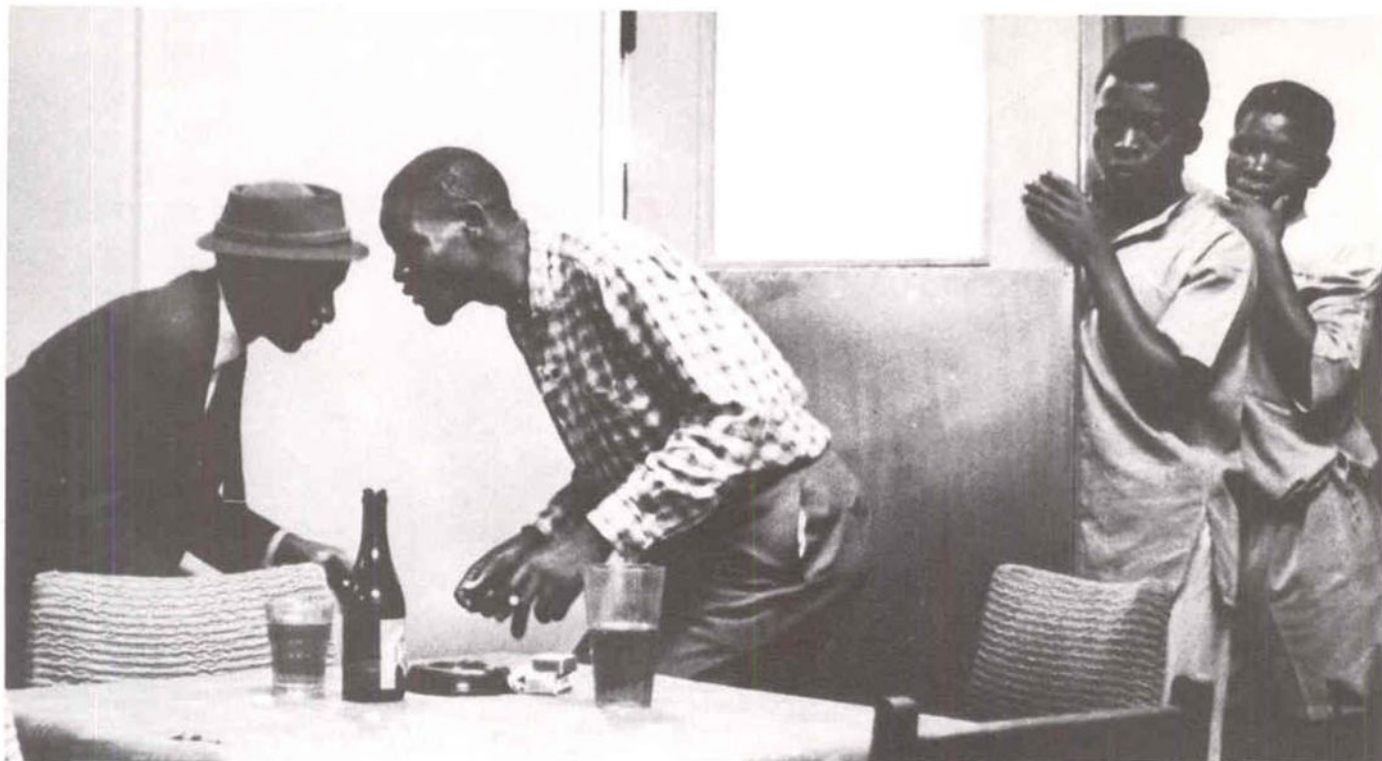
Cropping is a very simple technique involving the exclusion of unwanted areas of the negative to give precisely

Planning your enlargements Use a contact proof print and a pair of L-shaped card masks to determine how your enlargements can best be cropped

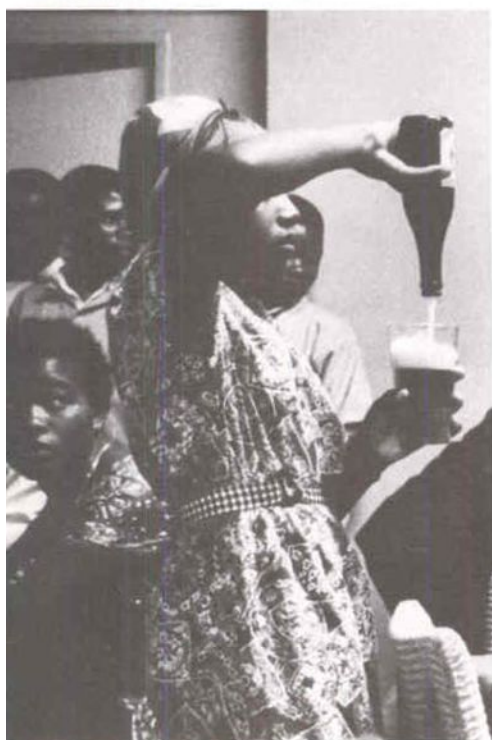
Clive Helm



Frank Herrmann



Many pictures from one A good example of a picture which can either be left alone as a 'situation' photograph, or cropped and selectively enlarged to produce a number of quite separate images. A possible 'improvement' is to remove unnecessary detail at the top and bottom (left) but this unusual format, for all its added impact, does not match standard print paper formats, so some area of paper must be masked during exposure. Three selective enlargements are also shown, but even these images could be changed slightly if desired, to produce further variations





the framing you want. This can be done either by masking off the negative or the print paper, or merely by trimming the finished print. Although trimming the print is obviously the simplest method, it is very wasteful and involves losing any white borders. These are particularly useful on a print which will be handled a great deal, as it keeps fingerprints off the image.

Cropping with masks

It is usual to stick to a rectangular format and cropping with masks involves straight edges to cut off the picture parallel to the edges of the negative, though this also gives an opportunity for correcting sloping images caused by not holding the camera level.

Most better quality enlargers have built in sliding masks in (or close to) the negative carrier. Normally there are two masking strips that slide across the negative and two that slide up and down so that you can mask off the negative on all four sides.

The masks built into an enlarger negative carrier are not intended for precise masking or for giving white borders to enlargements. As such masks are not exactly in the plane of the negative their edges are not sharp when the image is in focus, even if the enlarger lens is stopped well down. Also, few sliding masking strips give a perfectly rectangular opening and prints masked in this way usually have to be trimmed.

The real purpose of built-in masks is to confine the image on the baseboard to just the area of the negative that is to be included in the enlargement. A large area of unused negative around the part being printed increases the risk of flare and light scatter. This is particularly serious when making positive prints as

highlights of an image can lose contrast and become muddy and fogged. The problem becomes especially severe if a negative is much smaller than the negative carrier. No clear glass should be allowed to project onto the baseboard as this really does increase the flare level in the enlarging lens, to the extent that image quality becomes degraded.

Using a masking easel

A masking board paper holder (or masking easel) on the enlarger baseboard is an almost essential accessory as it makes cropping simple and accurate, and at the same time ensures that the printing paper is held flat and in the right place on the enlarger baseboard. A masking board has two adjustable metal blades which, in conjunction with two fixed rails, determine the area of the image recorded by the paper. Provision is also made for giving enlargements white borders in widths of 5 mm or more.

In cropping, a sheet of clean white paper of the size to be used for enlarging is placed on the board and the mask strips adjusted to the print image size required. There is no need to stick to a standard image size just because it is the size of paper in use. The size and proportions should be settled with just the picture requirements in mind.

The height of the enlarger can be adjusted and the masking board moved until the required part of the negative is framed precisely within the format created by the masks. You should spend plenty of time in doing this as it saves any later cropping. Also, the impact of a picture depends very much on good framing and this means filling the picture area adequately but not too tightly.

It has become fashionable to dispense with white print borders and you may

Playground Printed 'straight', the whole shot is much less inspiring than it could be. Cropping the image down to the figures and concrete channel removes much of the unnecessary and distracting detail, and makes a stronger picture

feel that flush cropping is attractive, as indeed it is. However, in the case of enlargements that are likely to be handled a great deal a white border is almost essential. Even with the most careful handling a print becomes a little dog-eared in time. If it has a reasonable white border it can be lightly trimmed to restore its appearance but if it has been closely cropped and flush trimmed no further trimming is possible without losing the border.

If you wish to make enlargements without white borders, magnetic corner clips can be used to hold printing paper down by its corners without encroaching on the emulsion area. These clips are specially made for the task but you have to use a masking board which has a platen of steel or iron.

Not all enlargers have masks built into the negative carrier. On many types without masks, you can put a mask of black paper or card in contact with the negative, the mask size being chosen to suit the area of the section of the negative being enlarged. Really close cropping in the negative carrier is not important as long as no clear rebates are included in the projected image.

If you have to make your own masks for insertion with the negative, use matt black card or cartridge paper. The problem is that any slight flaws in cutting this are magnified along with the negative. Card masks can, however, be used successfully for coarse adjustments, while fine adjustments can be left to the

masking easel. The coarse mask at the negative stage reduces the amount of unwanted image spilling over the print area, so reducing light scatter.

Cropping to fit

Although some photographers object to having their pictures cropped, most newspapers and magazines crop pictures to their requirements. Sometimes this is to increase the impact of a particular shot—by closing in on interesting detail in a crowd, or by cutting out redundant background area. More usually, though, they crop to fit a photograph into a particular space on the page.

Similarly, one of the most common reasons that photographers crop is to get the picture to fit a certain size of print paper. The proportions of a 35 mm negative, for instance, match very few of the more popular paper sizes and it is tempting to crop all the time to fill the paper. With 20 x 25 cm paper, this means cropping a sixth off the end of the negative.

Nevertheless, there is considerable scope for 'creative' cropping. If you have a portrait, for instance, you may be able to produce a stronger picture by closing in on the head a little more.

Selective enlargements

With good quality negatives, considerable enlargement is possible before the image breaks down and becomes grainy and unsharp. Rather than, as in cropping, simply recomposing to improve a picture, you can sometimes create new pictures from an old one by selectively enlarging just parts of it. The only difference from 'straight' enlarging of the full negative is that you choose to discard any irrelevant detail within the picture from the outset, and can change the degree of enlargement specifically to make full and proper use of the available print paper size. And afterwards you can crop the print image (or print).

Contained within a single street scene, there may be several striking candid portraits. All they need is careful framing and enlargement, though of course with considerable enlargement print quality suffers. This sort of selection opens up fascinating possibilities and gives the darkroom technician just as much creative power as the photographer.

A set of contact proof prints is an especially useful aid when it comes to planning your selective enlargements. A pair of L-shaped masks placed on a proof print can help you determine the best format for your pictures beforehand.

But it is very easy to crop out too much. In many photographs, the interrelation between the various elements is important to the general impression conveyed by the picture. By singling out a few areas, this impression may be lost rather than reinforced.

With a shot of a footballer leaping to head the ball, you may be tempted to crop in on the figure and leave out the ball. But the ball is an important part of the action and to exclude the ball means losing some of the meaning of the shot.

A more famous example of unnecessary cropping is a picture of a serviceman returning home from Vietnam. Tightly cropped, the picture shows little more than a couple embracing upon reunion. But what had been cropped from the picture was a discarded crutch, lying some feet away on the ground. Without the crutch, it is not clear that the serviceman is an invalid, and much of the impact of the picture is lost. The crutch invites the viewer to look more carefully into the picture, whereupon few will fail to notice that the soldier has a leg missing. On the cropped image, this is not apparent, and the picture is dismissed as just another 'coming home' picture.

Nevertheless, the creative possibilities opened up by learning to crop judiciously are immense. Although some features should clearly be cropped out, creative cropping is essentially a question of personal judgement.

Homecoming Take care not to crop out too much and remove detail essential to the meaning of the picture. The added impact of the lower picture is due solely to the presence of the discarded crutch, cropped away in the other version





Assignment

US Grand Prix

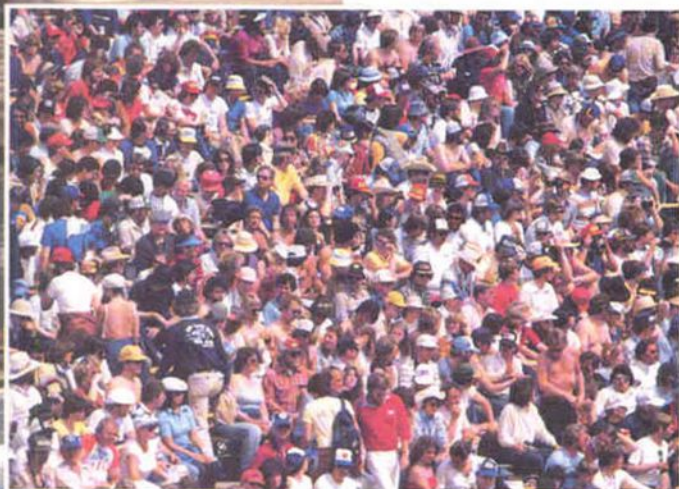
Motor racing is one of the most exciting and glamorous sports. It can be great fun to photograph, even with the simplest camera. Nigel Snowden took these pictures at the United States Grand Prix West

When the US Grand Prix West is held at Long Beach, California, good weather is almost guaranteed, but good weather does not guarantee good photographs. Grand Prix motor racing is, perhaps, one of the hardest of all sports to photograph effectively because it relies for excitement on elements which are difficult to capture on film—the continual struggle for the lead, the buzz of the powerful engines and, above all, speed.

In an effort to trap the essence of speed, many photographers who go to major racing circuits establish themselves near a fast bend and spend the day getting panned shots of the cars. By setting a slow shutter speed and panning the camera carefully with the moving car, they keep the car sharp but the

Close-up The helmeted face of Jean-Pierre Jarier is caught with an 85 mm lens while mechanics attend to his car

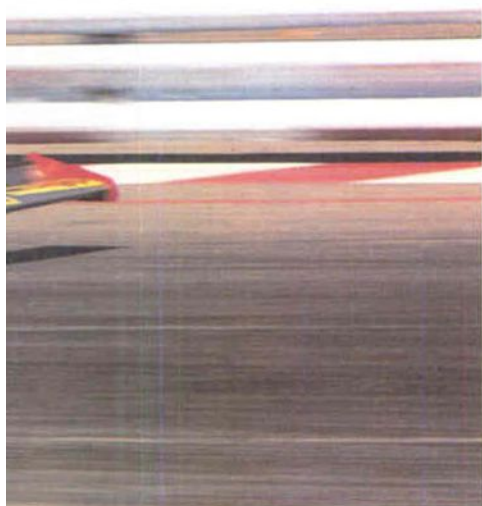




Spectators A colourful section of the huge crowd in the stand is revealed with the aid of a 180 mm lens



A motor racing fan Michelob is the official beer of the Grand Prix! An amusing shot with an 85 mm lens

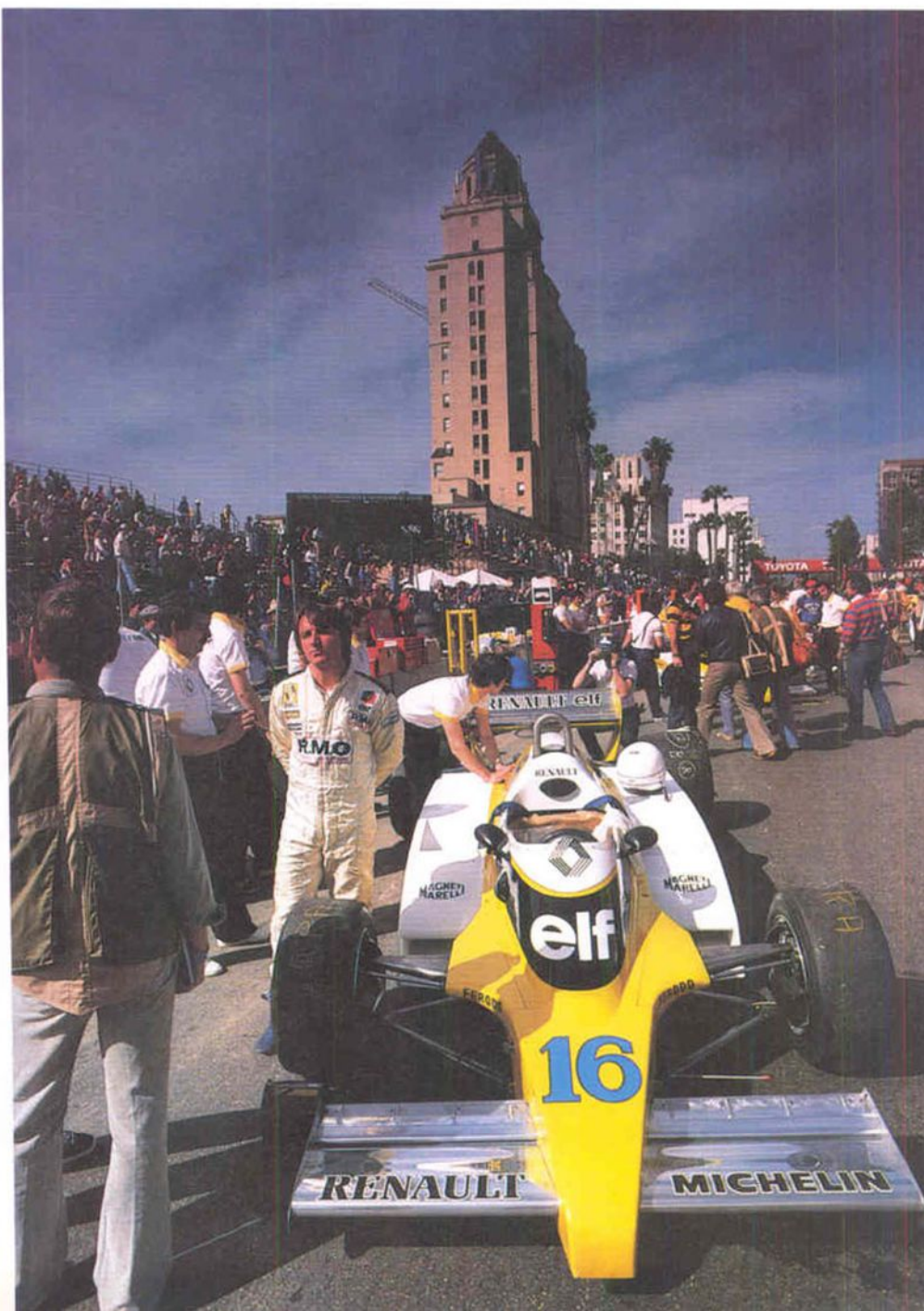


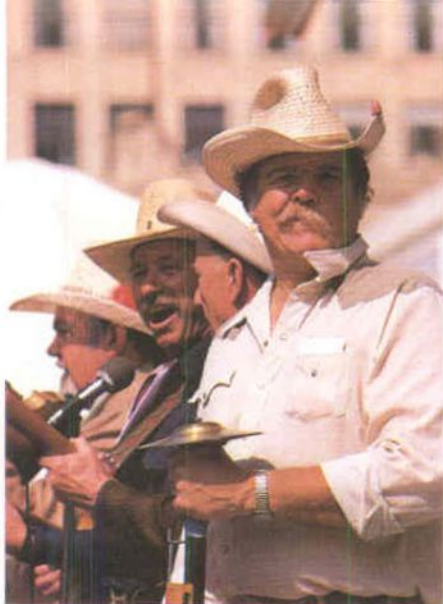
Nigel Snowdon

Panning the camera A passing Ferrari is captured with a slow panning shot, taken with a 135 mm lens, 1/250 at f/11

Pit stop The unusual building makes an interesting backdrop. Nigel used a 20 mm lens with a graduated filter

Incident This dangerous moment on the first lap when two cars were put out of action was taken with a 135 mm lens





Celebrations After the race, country and western music comes to the streets of Long Beach, and everyone relaxes

took very few of these shots and looked elsewhere for his subject matter. The few slow shutter speed panned shots he did take were shot from positions where he could get close to the track and ensure an interesting composition.

Although most of the obvious action is on the track, Nigel found many of his best photographs in and around the pits and paddock. Shots of the drivers preparing for the race, cars running into the pits for repairs and celebrations after the race show all the flavour of the occasion and provide a far more interesting and varied selection of pictures than you can get at the trackside alone. And there is always plenty of potential for candid shots among the spectators.

stationary background is blurred into an indistinct streak. This type of shot often conveys movement far better than a shot with a fast shutter speed that freezes the moment and keeps even the background pin sharp.

Nevertheless, despite their popularity, these panned shots are frequently dull, not only because they are so common, but also because the high speed of the cars and the poor viewing positions lead to unsatisfactory composition. When Nigel Snowdon went to Long Beach, he

To make the most of subjects like these, you must establish a good viewpoint. Professionals obviously find it much easier to get the best positions and have various special privileges. Nigel, for instance, was allowed to drive around the circuit a few days before the race to find out where to shoot from. Nevertheless, providing you get to the course very early on the day of the race and spend a couple of hours searching you should discover a number of suitable

viewpoints for various stages of the race. You should then be able to move quickly into place when things start to happen. You may even be rewarded by shots of drivers putting in early practice.

Some racing circuits have special viewing towers which amateurs can use, but to shoot from these you need a very long lens—at least 300 mm. Places in these towers are at a premium—even in the professionals' tower, Nigel found he hardly had room to wind on and was very glad of his motor drive.

Nigel used a 20 mm lens for many of his general views and shots of preparations in the paddock, but undoubtedly medium telephotos are the most useful lenses for this type of event. In fact, Nigel took quite a range of medium telephotos, from 85 mm to 180 mm, but for the track shots in particular, the 135 mm was ideal, combining a reasonable degree of magnification with ease of handling and a fairly wide maximum aperture.

Another useful piece of equipment is a monopod. Some sort of support is essential for the really long lenses: a monopod is easy to carry and set up in restricted spaces and is ideal for panning when you are taking action shots.

One further essential is a UV filter to cut down some of the haze that can hang over the track on hot days—Nigel had one on every lens.



Gilles Villeneuve The bright red racing colours of the Ferrari make a particularly attractive and appealing subject



The big moment A 180 mm lens picks out and closes in on some of the personalities at the presentation



Creative approach

Backlighting

If subject detail is unimportant, you can forget the old advice about keeping the sun behind you and shoot against the light. From soft focus to sunsets, backlighting can make even dull subjects glow with life

Following an old formula designed to light a subject adequately in the days when equipment was very basic, many photographers shoot with the sun behind them whenever possible. This is a pity because, although this technique may be safe for reproducing a scene accurately, the results are usually flat and frequently uninteresting.

There are many subjects which are far better portrayed in an unusual light, particularly when you are trying to

create a mood or communicate a certain atmosphere. Although only frontal lighting will illuminate the subject properly, you can often make far more attractive pictures when the light is behind the subject.

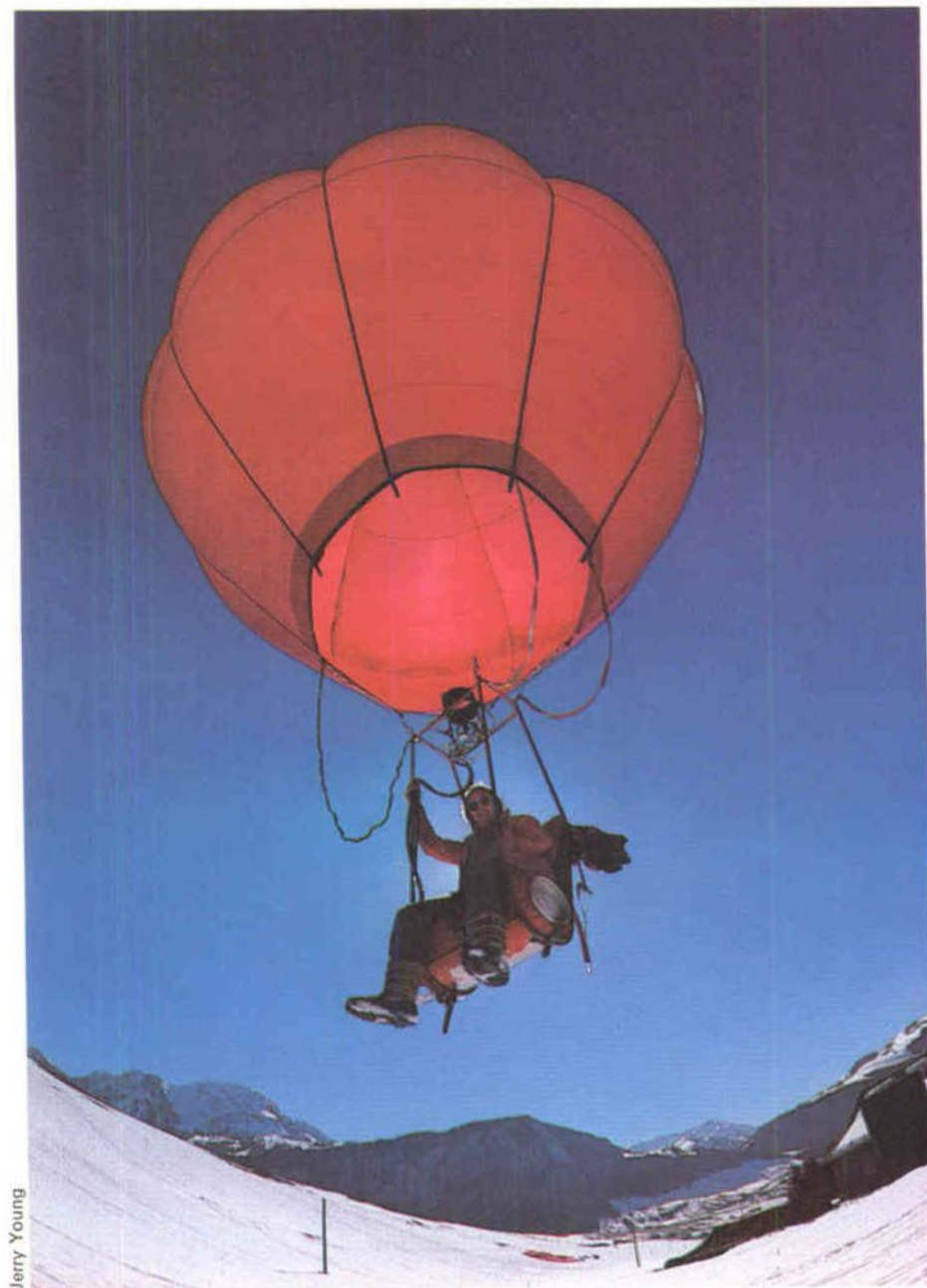
Backlighting can give very appealing results but it has to be treated with care, especially when the lighting is fairly strong. Portraits, for example, lend themselves to backlighting and rimlighting, but, since contrast is much greater than

for an ordinary flatly lit scene, much care is needed to get the exposure right. However, once you have overcome the technical problems (see page 32) exploiting backlighting can make a tremendous difference to a wide range of subjects.

One of the most important qualities of backlighting in very clear weather is the tremendous extremes of light and shade it creates. Many photographs taken in frontal lighting frequently look dull, not simply because the colours tend to wash out, but also because even the modern photographic process compresses the range of light and shade in the picture considerably. With backlighting, the scene has such extremes of light and shade that even after compression in the photographic process, the picture still has all the sparkle you could want. Translucent objects lit from behind can glow with rich colours, set off beautifully by deep shadows. Shiny surfaces may shimmer brilliantly in a high key picture. Or you can highlight an interesting outline

Balloon Hot-air balloons, with their brightly coloured translucent fabric can look very attractive when photographed against a bright blue sky

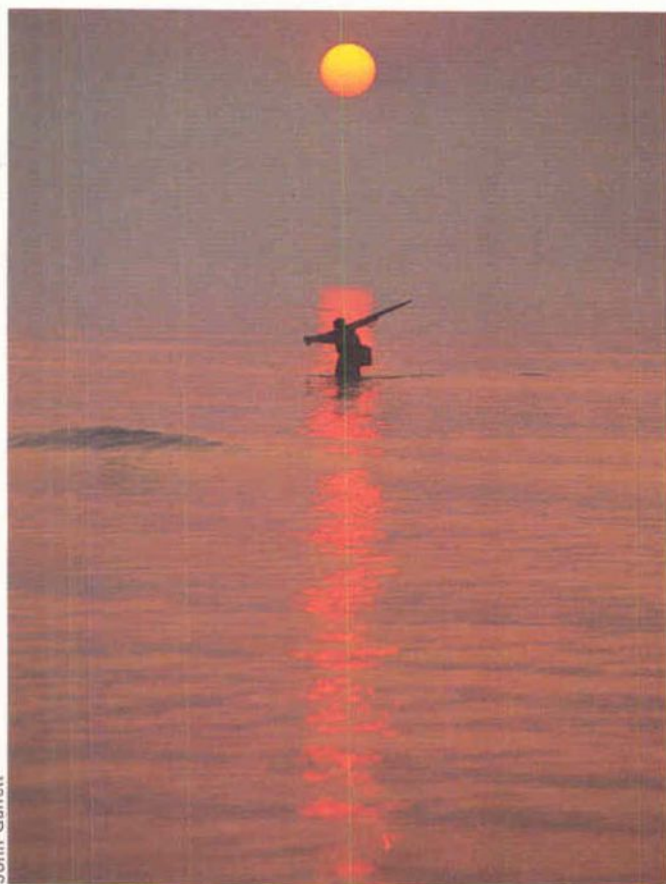
Flower By revealing the thinness of the petals, backlighting brings out the delicacy of a flower and highlights its pale but rich colour



Jerry Young



J. A. L. Cooke/Oxford Scientific Films



Lone fisherman Many subjects can be effectively silhouetted against a setting sun. Here, a lone angler makes a poignant silhouette against the sun's reflection on the water



Reading in the park Low angle sunlight makes a very good backlight, giving a warm yellowish green colour to leaves and grass that helps to create an air of peace and calm

by silhouetting it against a stunning sky.

Sunsets and sunrises provide the most popular, yet still some of the most attractive opportunities for backlighting. Very few subjects are strong enough to compete with the rich hues of the sky even if there is enough light. It is usually better to forget about giving enough exposure for foreground objects. Go to the other extreme and expose for the sky to throw the foreground into silhouette. Dark trees, figures, buildings and many other isolated shapes can look superb outlined against the beautiful colours of the sky.

Less of a cliché, but often equally pleasing, are silhouettes caught at other times of day. Since the sun must be behind the subject, this sort of shot is usually easier in winter when the sun is low in the sky. But if you can get below the subject and shoot upwards, you may be able to get a good silhouette even with the sun high in the sky—looking up under a tree, for instance.

Silhouettes are often associated with seascapes and picturesque landscapes, but they can be used to turn even the most mundane scene into something interesting. Urban and industrial land-

Tree in the mist Backlighting is ideal for misty conditions—it can emphasize the mistiness while giving a good range of brightness



Sergio Dorantes



Deck chairs Even the most mundane objects can be attractive when backlit. A wide angle lens and strong composition made a successful shot of these chairs

Goat and tree Silhouettes can be found at any time with a bright sky and a low viewpoint, but you should keep the subject very simple and obvious

C. C. Lockwood/Oxford Scientific Films/Animals Animals





lit mist can be very attractive, so too can raindrops on windows, dew on spiders' webs, icicles and many other semi-transparent objects. With backlighting, they sparkle brilliantly against the sun. But you may have to get up early to catch the sun at a low angle.

If you use an SLR and can focus down to 50 cm or less, you can move in close to water. Remember, though, that depth of field will be minimal when working so close, and that you must therefore focus very carefully to capture a backlit subject sharply.

Any translucent object may be especially attractive when backlit, and there are probably more man-made opportunities now than ever before, because of fast growing sports like hang-gliding and windsurfing. The brightly coloured billowing sails of hang-gliders, conventional sailing boats and windsurfers are understandably popular subjects that benefit particularly from backlighting. The structures of hang-gliding equipment and sails are literally highlighted in this way, as the struts show up dark, contrasting with the bright, colourful material.

The balloon is another translucent object which benefits from this kind of treatment. Whether you are dealing with a

Julian Calder

scapes with forbidding buildings and smoking chimneys can take on an attractive two-dimensional quality when their outlines are lit by a low, weak sun.

To produce results like these, take your meter readings from the brighter areas of the scene. By exposing for the middle tones you can produce a semi-silhouette effect, but to do this you need to open up the lens by about two stops or more to restore some colour and detail in the shadow areas. This technique is particularly appropriate when photographing a scene such as a figure on a shore. It can also be used to liven up a city skyline when the sun is rising or setting behind a group of buildings.

The effect of backlighting varies according to the time of day and to weather conditions. If there is a mist in the air, for instance, sunlight is scattered and diffused by the minute droplets of water in the air. This effect is particularly obvious when you look towards the sun. Sometimes you may not even notice the mist until you turn round and face the sun. Then the sunlight is reflected in all directions off the water droplets and diffused into a brilliant haze. While backlighting gives extremes of light and shade in clear air, in mist it can actually reduce the tonal range and the intensity of colours.

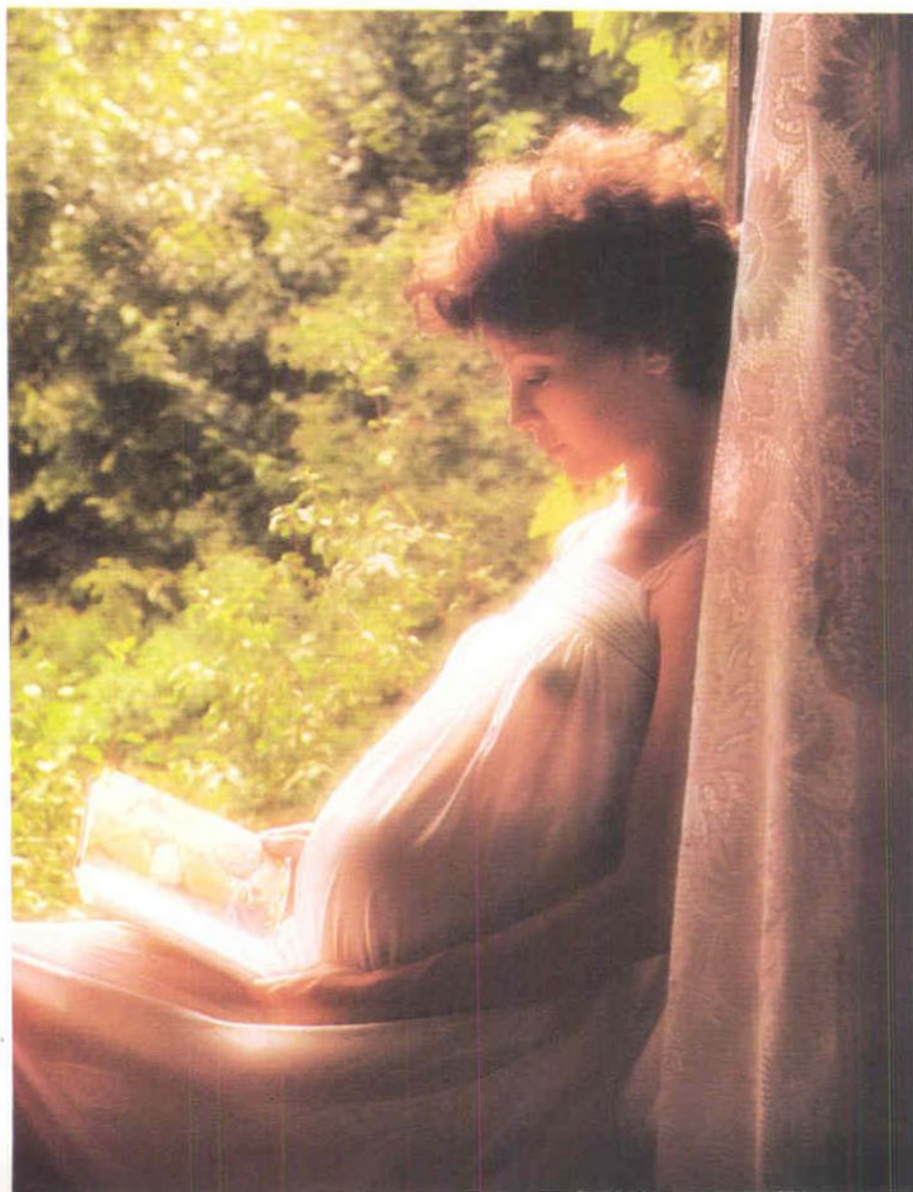
When you want a simple straightforward shot of a scene, backlit mist is a nuisance and may be impossible to handle even with a polarizing filter. But if the mist is fairly thick, it can, in the right circumstances, provide beautiful atmospheric shots full of pastel colours. In the early morning, when the sun is low, it can be included in the frame shining palely through the mist. A few vague shadows of trees, or a figure seen dimly in the distance provide an evocative scene.

Light mist under the trees, like dust in an old high-windowed building, may catch the sun in brilliant shafts of light that stand out clearly from the darkness of a wood. A small, interesting subject caught in such a shaft can make a stunning photograph. So too can a wider view.

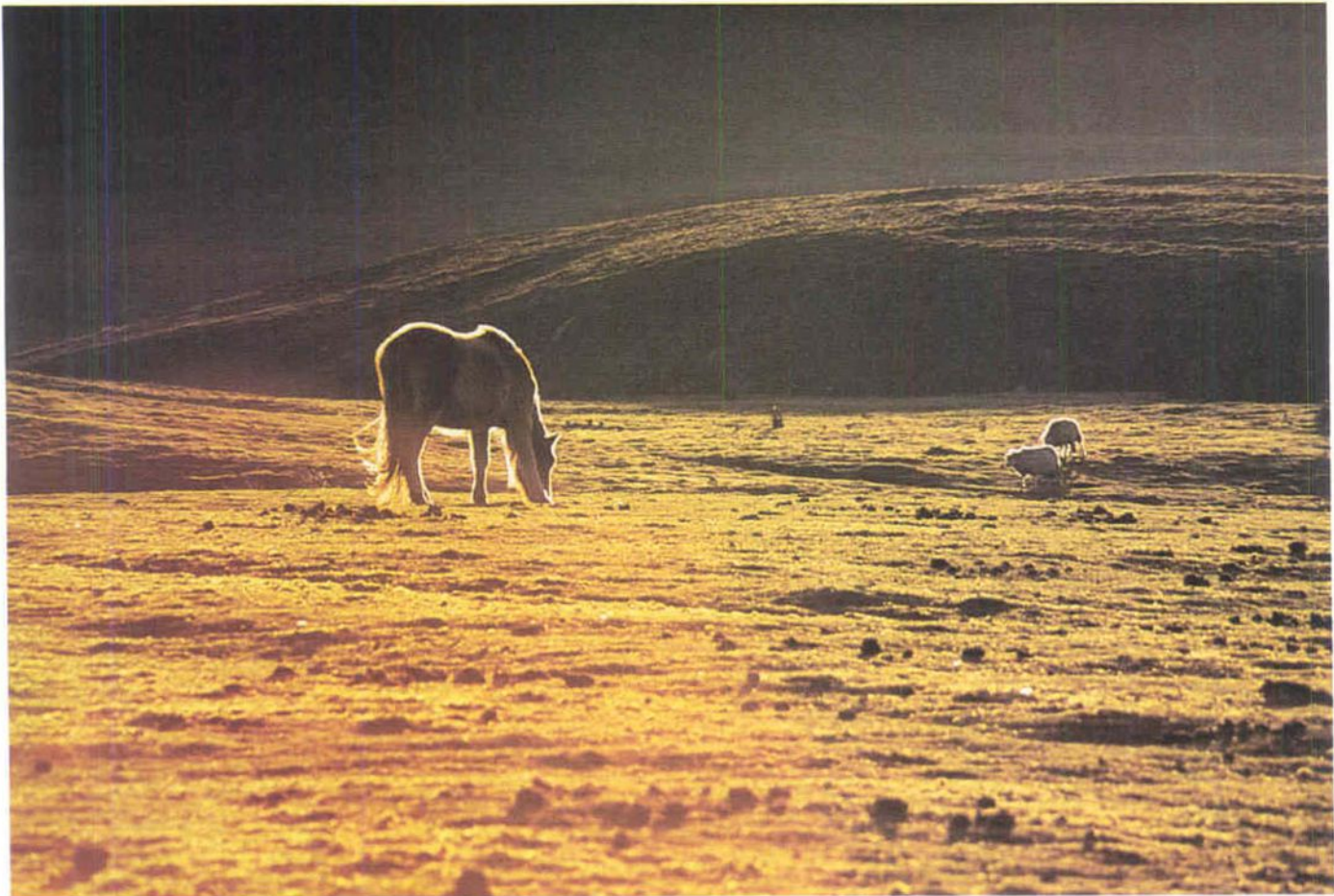
Just as the tiny water droplets of back-

Girl and dog Backlighting has always been popular for portraits because it softens outlines and provides an attractive halo around the head

Expectant mother Soft focus shots benefit particularly from backlighting—slight overexposure in the background adds to the dreamy quality of the image



John Garrett



Colin Molyneux

child holding a party balloon on a string, or the huge air balloons used for sporting purposes, the basic approach is the same. A viewpoint at ground level can often be unexpectedly attractive with air balloons, particularly if you can shoot the fabric against a high sun or brightly-lit sky as the balloon gently takes off.

Naturally, it is not always necessary to seek out balloon races or hang-gliders in order to try your hand at backlighting semi-translucent objects to good effect. Leaves on branches, particularly in autumn, and indeed most flowers, can be eye-catching in much the same way.

One subject that springs readily to the professional photographer's mind when he hears the term 'backlighting' is portraiture. Indirect lighting is often used because it is much gentler than the bland, even illumination of direct sunlight.

Sunlight catching a model's hair from behind often creates an attractive halo of light, but raises the overall contrast of the scene. The contrast becomes much more manageable if you use a piece of white card to reflect light on to the face. You can achieve quite a flattering range of pictures of the same subject's face by changing the position of the reflector. In addition you should experiment with different exposure settings, where possible, to achieve the optimum balance between the strongly backlit halo of hair and the gentler lighting of the face. The final result, with light from behind and above accentuating the hair outline and lifting the subject cleanly from the back-

White horse Lit from behind, the texture of the horse's hair and the blades of grass show up clearly and the bright rim separates them from their background

Ostrich Half visible, half silhouetted, this ostrich provides an interesting, almost abstract design—a far more arresting image than a conventional frontlit shot



Lee E. Battaglia/Colonic

ground, can be very pleasing.

As a broad guide to exposing for backlit portraits, always aim to expose for the area of most importance. If you wish to give prominence to detail in the face, then take your meter reading close to the face. If this is not practicable, estimate the exposure, remembering that meters are often fooled by extreme lighting conditions. Ideally, you should try to take readings from both the highlighted and the darkest parts of a subject and aim for an exposure somewhere between the two. Dealing with extremes of contrast by using reflected light or fill-in flash is covered in a subsequent article.

When you are not aiming for a literal interpretation of a subject, make the most of form for its own sake. Interior shots of people—particularly in profile—strongly backlit by a window or silhouetted against the light source can be very eye-catching.

A particularly colourful kind of subject which can only be photographed backlit is the stained-glass window. Very pleasing results can be achieved in colour, although again exposure can present a problem. Wherever possible, get close readings from the lightest and darkest glass and aim for an average setting. Beware, though, of strong sunlight here because intense lighting can emphasize unwanted detail beyond the window, such as protective mesh, spoiling the result. An overcast day, or less direct lighting, is definitely better for showing the beautiful colours of the glass.

Film speed and grain size

Too much development of a black and white film leads to excessive contrast, and too little gives flat, thin negatives. Only the right combination of exposure and development leads to really good results

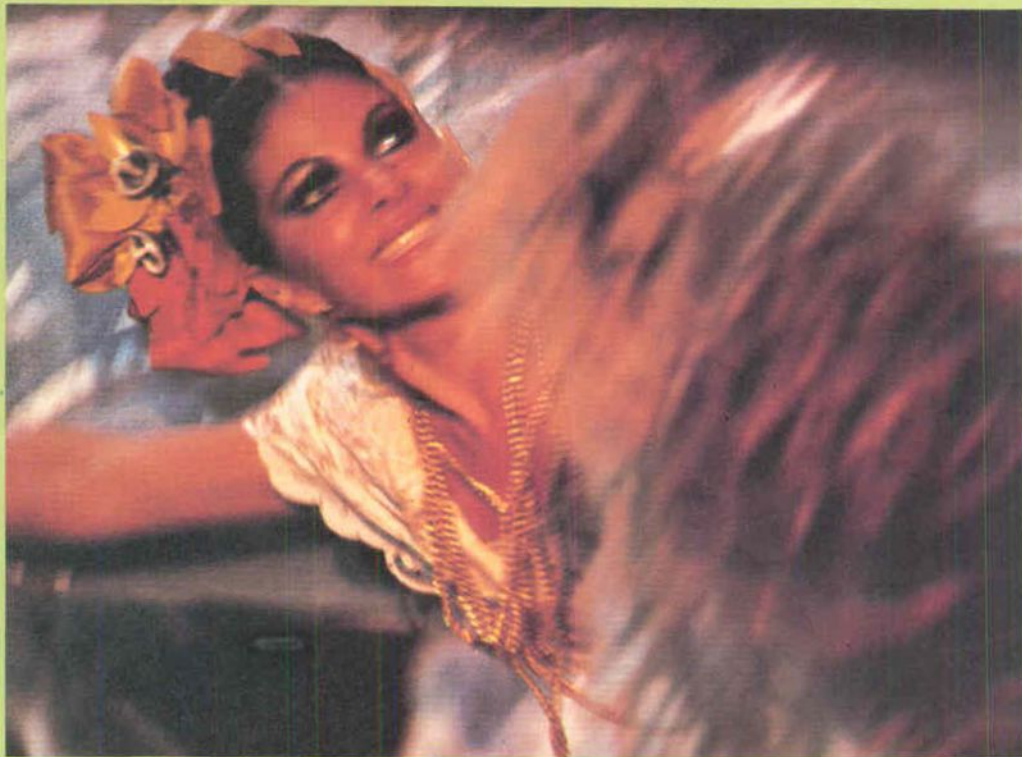
Modern emulsions are remarkably versatile and perform well over a wide variety of conditions. But to produce high quality negatives, they need precisely controlled exposure and development. Without accurate exposure, the negatives tend to become too thin or too dense; without correct development, contrast is poor.

Density and contrast

Now that the majority of photographers have access to accurate light meters, incorrect exposure is far less common than it used to be. Yet there are still many circumstances in which it is relatively easy to make errors in exposure.

Overexposure combined with too short development produces negatives with insufficient contrast, and though you can sometimes compensate for this by printing on a very hard grade of paper, generally the results are unacceptable.

On the other hand, if a slightly overexposed film is developed for too long, contrast can be so severe that sometimes even a very soft



Sergio Dorantes

Flamenco dancer

Sometimes photographers overdevelop to gain film speed. Unfortunately, this increases grain and can change the colour balance

grade of paper cannot yield good prints from negatives. This is essentially because a developer works most actively on the areas of emulsion that have received the most light. Highlights gain in blackness quickly, while shadows blacken only slowly. So as development progresses, the difference in blackness between the highlights and shadows becomes more and more pronounced.

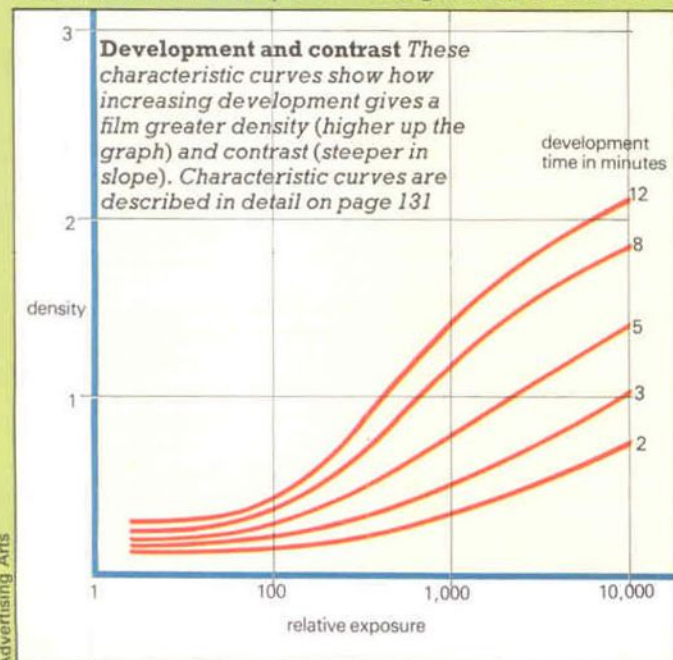
However, the gain in contrast cannot go on indefinitely. Every film has a contrast limit beyond which an increase in development time no longer results in a comparable increase in contrast.

Although, essentially, exposure governs density and development controls contrast, there are occasions when the contrast range can be increased by varying exposure. Controlled overexposure, for instance, is a useful technique for increasing contrast in scenes where the contrast range is small, on a misty day for instance.

Film speed and development

The speed of a black and white film can be increased by developing it for longer than usual, especially if a very active developer is being used. This can be useful in situations where there is not enough light to give full exposure. For example, a 400 ASA (ISO) film can be rated up to 800 ASA, provided it is given the necessary extra development. Manufacturers often suggest development times for increasing speed in the instructions packed with the film or developer.

However, you cannot increase the speed of the film in this way by more than double without severe loss of quality. Pictures can be obtained by rating a film at four or even eight times its official ASA speed and greatly increasing development, but the results are at best only just acceptable as this only increases the blackness of highlights and middle tones in negatives. There is no way



of obtaining shadow detail that was not put in the film by exposure. Pictures obtained with a very much uprated film have empty shadows, and contrast in the final print is certain to be too high. A developer goes on developing the higher densities in a film long after the lower densities have reached their limit.

However, extending development beyond a certain point actually decreases contrast, as the film becomes very dense. Since this occurs evenly over the whole negative, it appears as fogging, and the effect is called *chemical fog*. Once the negative has started to fog, the image deteriorates and shadow detail disappears. Some people claim phenomenal increases in speed by push processing, but the loss of shadow detail means that this increase is largely valueless. Nevertheless push processing can provide useful moderate increases in film speed.

Like black and white films, colour slide films can be push processed to increase their speed. Ektachrome 400, for example, can be exposed at up to 1600 ASA provided the time in the first developer of the E-6 process is increased from the normal 6 minutes to 11½ minutes. Tonal and colour quality suffer, but with the extra speed you may be able to shoot in conditions that are otherwise impossible.

Grain size

Graininess is nearly always undesirable in a negative because it reduces definition and can become obtrusive, especially with 35 mm or smaller formats. Grain size generally depends on the film used, but there are ways in which it can be increased or decreased.

If, for instance, a black and white film is slightly overexposed to increase contrast, graininess is also increased. This is because as you give more and more exposure to a monochrome film the light penetrates further and further into the emulsion layer and the silver image becomes thicker and thicker. At the same time, the smaller crystals of silver halide, which are less sensitive to light, become developable. The result is that there is so much silver closely packed in the gelatine that particles clump together to form large grains.

Even if particles do not actually clump together, they may appear to because in the thick emulsion you see many particles on top of each other—an effect known as *optical clumping*.

Just as overexposure increases graininess, so does overdevelopment. With moderate development many of the exposed silver halide crystals are not completely reduced to metallic silver, and the metallic particles remain small. With longer de-



Modern film Compared to the fast film that was available in 1945 (left), modern film offers remarkable quality. These enlargements show grain from 400 ASA film, old and new

velopment, however, every exposed crystal is fully reduced and the grains of silver are much larger.

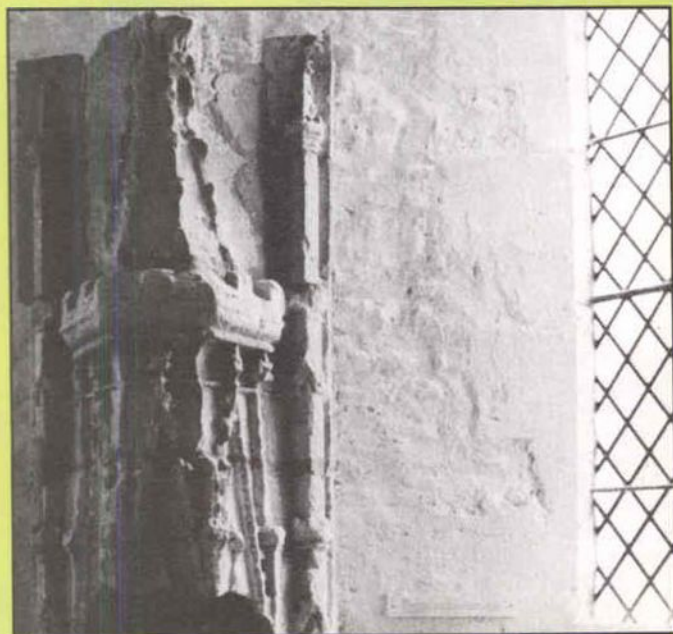
Optical clumping shows up very obviously as graininess on a negative and it is even more of a problem than real clumping—the effects of which are far less noticeable.

Speed and grain

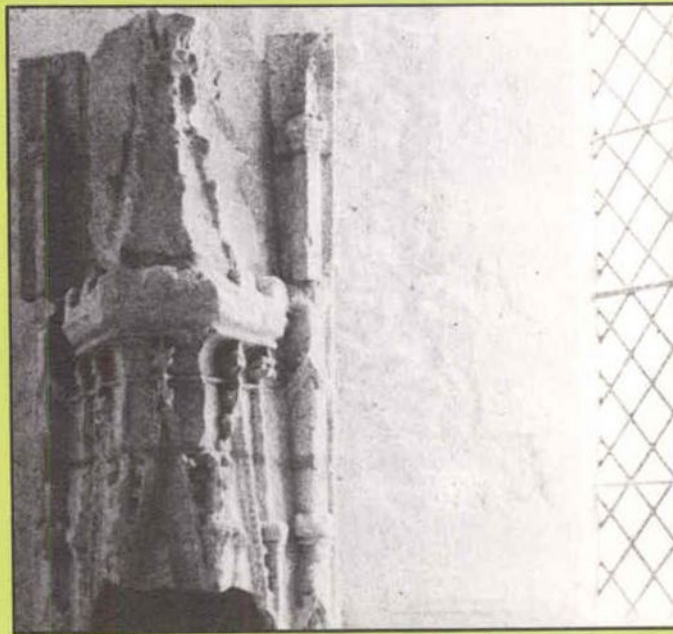
Emulsion chemists have succeeded in making increasingly fast film in recent years with remarkably fine grain characteristics. Even a 400 ASA film now has fine enough grain for most purposes provided it is exposed minimally and not overdeveloped. Nevertheless a fast emulsion has larger silver halide crystals than a slow one and it is

consequently more grainy. Moreover, graininess is increased by overexposure and overdevelopment far more with fast films than with slow films. A degree of overexposure or overdevelopment that has little effect on the grain of a slow film will have a marked effect on a fast one, so extra care is needed when developing fast film.

The new chromogenic black and white films, such as Ilford XP1 and Agfa-Gevaert Vario-XL, give a grain size normally associated with medium speed films even though they are both rated at 400 ASA. Because of the importance of fine grain with small format cameras this type of film is likely to become very popular.



Correct exposure and development Even when considerably enlarged, film that has had minimum exposure and development does not show an excessive amount of grain

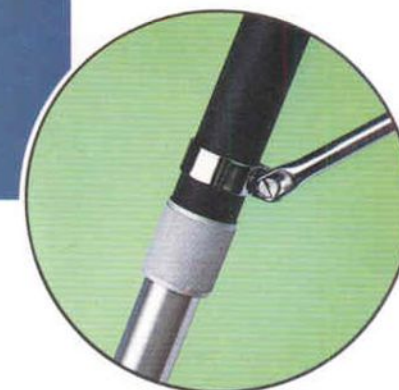
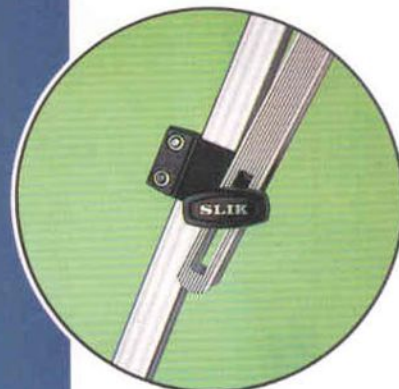
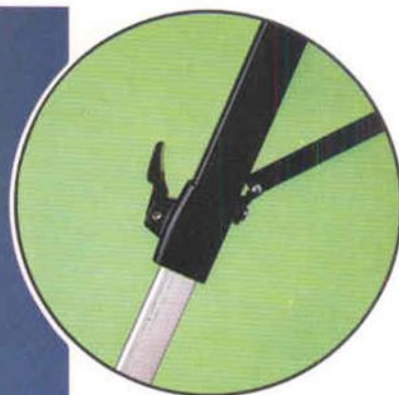
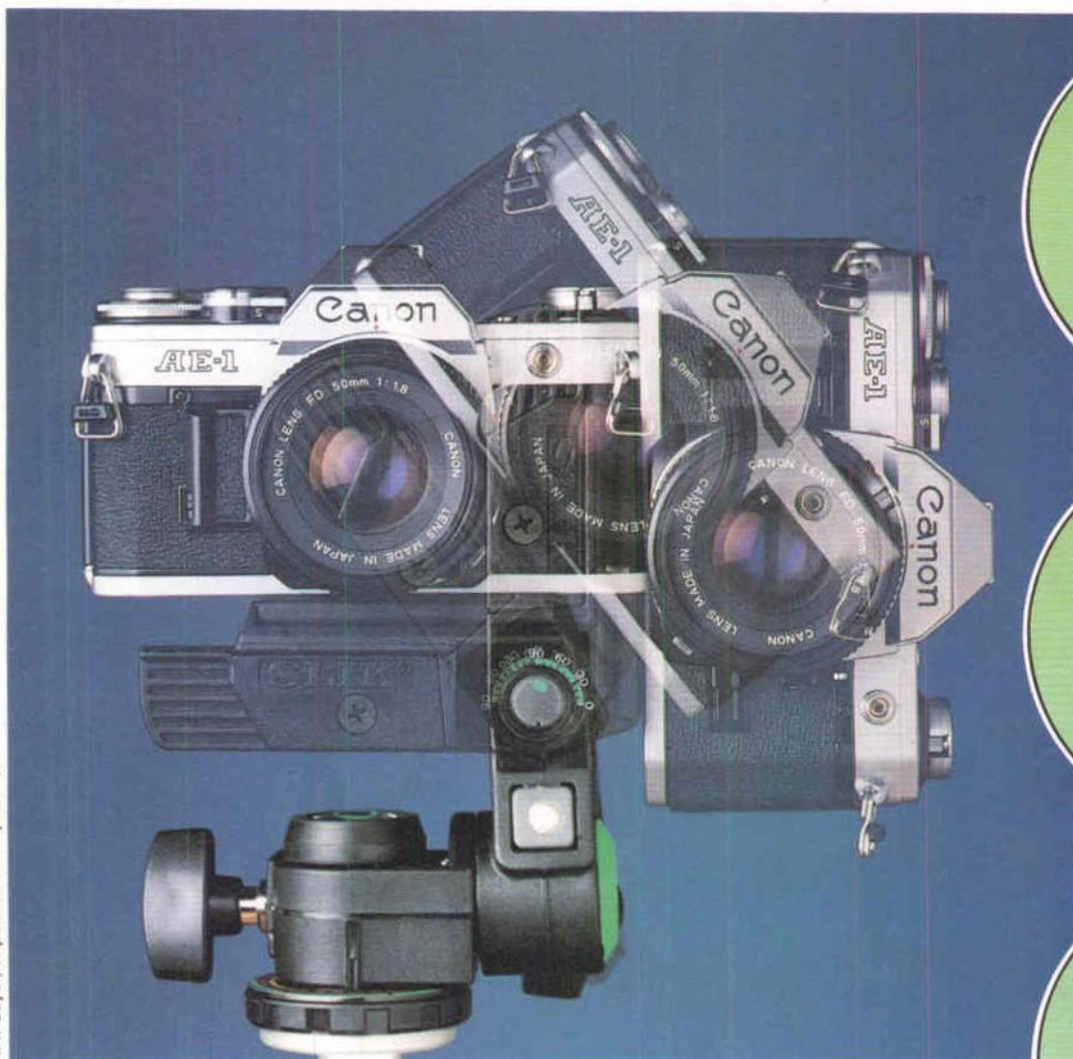


Too much exposure and development The quality of a negative gets much worse if exposure and development are excessive. The picture is less sharp, and grain is coarser

Choosing a tripod

A good tripod must be light enough to carry around easily but sturdy enough to provide a solid camera support—even when a heavy telephoto lens is fitted or the exposure time is measured in minutes

Kim Sayer/Tripod loaned by ALCO



With shutter speeds of tiny fractions of a second, it may seem unlikely that camera movement during exposure can have any significant effect. Yet camera shake is still a very common cause of poor photographs—indeed, some people believe that camera shake can make a difference to quality even when shutter speed is as high as 1/500 second. Unfortunately, simply using high shutter speeds to avoid camera shake is no remedy—this only makes it impossible to get the best out of some shots—but there is a solution to the problem. A tripod, which holds the camera completely still during exposure, not only prevents camera shake but also enables the full speed range to be used to best advantage. A tripod is, therefore, a very valuable addition to your range of equipment, but what should you look for before you choose?

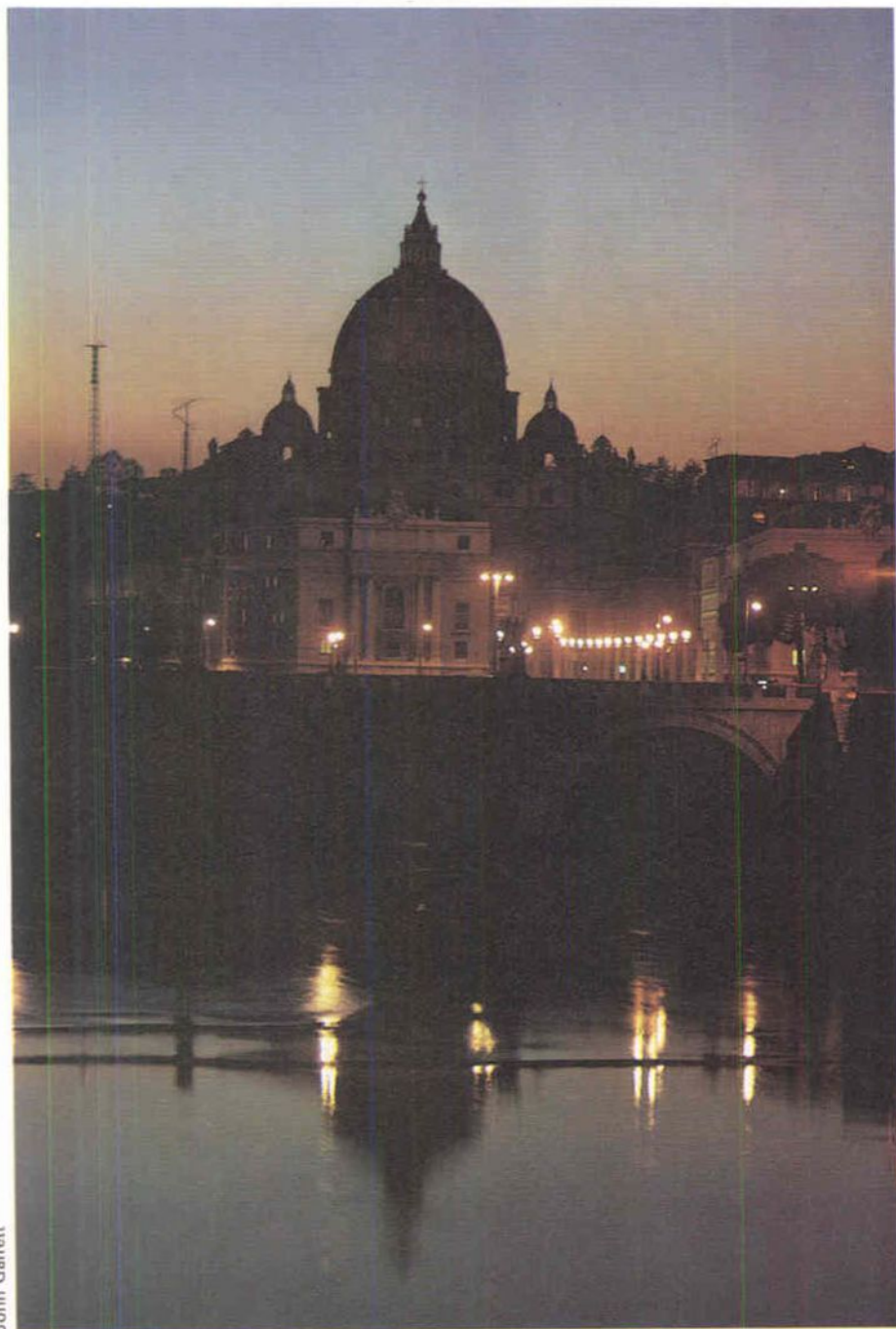
Travelling light

Tripods must be light enough to carry easily and sturdy enough to withstand light breezes or vibrations, so almost all modern tripods are built from aluminium alloys. The legs are made as tubes or as a U-channelled, box-like construction. The circular tube style is generally more rigid than other types but is usually a feature of heavier and more expensive models.

For the photographer, the shiny, natural finish of aluminium tripods can sometimes be a disadvantage. In close-up photography, for example, or in copying work where you are focusing down on the subject through a sheet of glass, it is sometimes hard to avoid a reflection of the tripod appearing in the picture. And when photographing birds or other timid animals, a bright silvery

Leg locks Channel section legs have either flip locks (top) or a threaded handle (centre). Tubular legs are locked by a threaded ring (bottom) which provides a very secure joint that is not prone to wear

Tilt top Many tripods have a pivoting camera platform. This is a valuable feature—it allows you to take both vertical and horizontal shots and the changeover can be made in a single action. Tripods without this feature are much less versatile



John Garrett

On the waterfront For night-time pictures, a tripod is essential, as it allows you to use long exposures without running the risk of camera shake. Even at dusk, exposure times may still be too long for hand-held shots

tripod might attract unwanted attention. In these circumstances it is better to use a tripod with matt-black legs. An anodised finish is preferable to black paint because paint can easily become chipped or scratched, revealing the shiny metal.

Leg length

Tripods vary enormously in size from small table-top models only 20 cm high to professional giants that can take a camera up to 3 metres off the ground. For portability and easy storage tripods need to fold up into a small space.

Rubber feet In order to get a firm grip on soft ground, almost all tripods have spikes at the end of their legs. But make sure that the spikes have rubber covers, or, better still, are retractable, or they may slip on flat, hard surfaces

The legs on modern tripods are usually telescopic with anything between two and eight sections, though most have three or four. The more sections a leg has, the smaller it is when folded up. Unfortunately, each joint in a tripod's legs is a possible source of unsteadiness and for maximum rigidity it is best to buy a tripod with as few sections as possible—even though this type may not pack down to as small a size as some others. It is better to have a bulky tripod that performs well than a compact type that may prove to be unstable.

Leg locks

There are two common methods of locking tripod leg joints into their extended position: screw threads and flip levers. The sections on tubular legs are normally locked by a screw thread mechanism—each section is pulled out to its full extent and locked into place by tightening the screw. U-channelled leg sections are normally fixed by the flip lever type of locks.

Both locking systems have points for and against them. Legs fitted with flip lever locks, for instance, can be set up much faster than screw thread leg sections. But though this may seem a great advantage, in practice speed of assembly is of limited value, because tripods are rarely used in situations where time is pressing. Inner leg sections, on some tripods with flip lever locks, can wear loose and may drop violently to the floor when the lever is flipped open. The jolt can damage or knock off the base plate of the bottom leg section.

Screw locking, on the other hand, provides a very rigid joint. In fact the screw locks on some professional tripods are so sturdy that they can be used as footholds when a photographer climbs up the tripod to reach the viewfinder—but this kind of treatment is not to be recommended for most ordinary tripods!

Whichever kind of leg locks you have on a tripod, it is important to make sure they are securely fastened before fitting the camera to the top. If one leg collapses suddenly your camera could be ruined. To prevent such accidents, some of the more expensive tripods have air cushion devices, built into the legs, that make it impossible for the legs to retract suddenly. And should the leg locks come loose, the legs telescope together only very slowly—giving you plenty of time to catch the camera.

To stop the tripod slipping, the feet must suit the surface. Most tripods are equipped with both rubber feet for hard shiny surfaces and spikes for soft ground. On a few tripods the feet are reversible, but on most the spike is fixed and the rubber feet are screwed down when they are needed.



Kim Sayce



Table-top tripods If space and bulk are at a premium, choose a table-top tripod. Some of these are very simple, but others are like miniature replicas of their full size counterparts

Centre column A rising centre column is an invaluable feature. This one is geared, and winding a handle on the body of the tripod moves the head steadily up or down

Holding the camera

One of the most important decisions to make when you buy a tripod is which of the two types of head to choose.

The ball and socket head uses a metal ball with a tripod-screw attached. The ball joint allows you to move the camera round through a full circle in the horizontal plane, and to tilt it up and down through about 40°. A narrow channel cut in one side of the cup allows the ball

and camera to point straight down at one place only. The disadvantage of this system is that the camera must be locked in each position. This means that to move the camera around you have to undo the screw, choose a new position, and then tighten it up again. The operation is therefore awkward and not very positive.

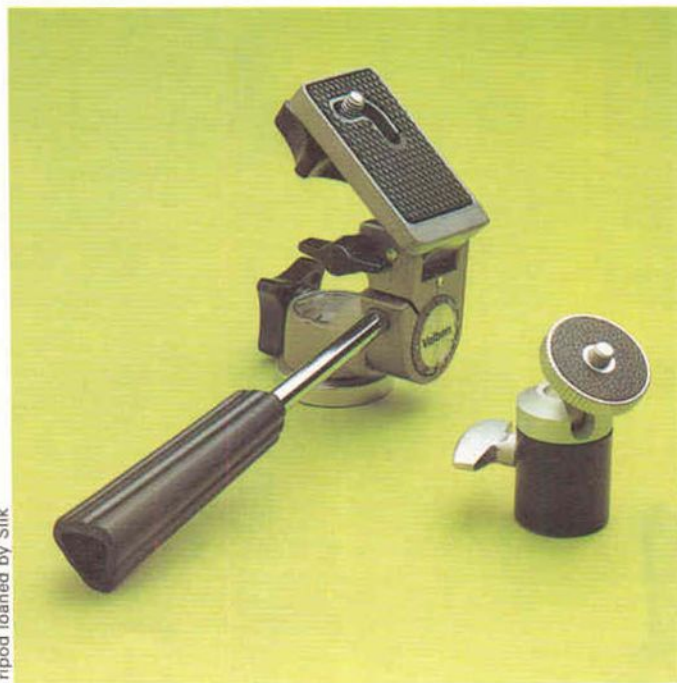
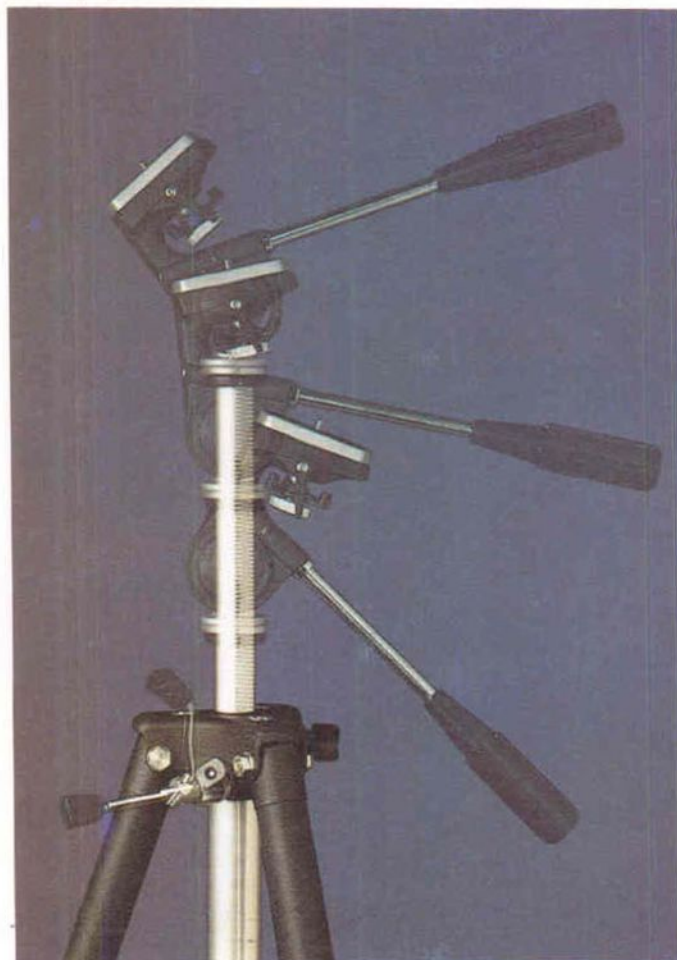
Camera movement is made much easier and much more definite on a tripod fitted with a pan and tilt head. Not surprisingly, this type of head is the more popular. The direction of the camera is controlled by a long slim handle. With this the camera can be panned horizontally through 360°—and tilted back wards or forwards. Twisting the handle locks either the tilt or the pan, or sometimes both. In addition to the pan and tilt, some tripods allow the camera base to be turned up through 90° for taking photographs in vertical format.

Some of the more expensive tripods have one or more bubble levels fitted to the head. These work in the same way as a spirit level—when the bubble is in the centre of the tube or dish of fluid, the tripod head is horizontal.

If you are taking only a single picture, levels are not important because the camera can be levelled with the pan and tilt or ball and socket head. Levels are more useful if you decide to take a series of pictures to show a wide panorama by panning the camera on the tripod between pictures. Unless the tripod is completely level, the camera moves up or down as you pan. You can judge whether the tripod is level by eye, but a bubble level makes it much easier.

On every tripod, the camera is locked on to the rubber-surfaced platform by a screw thread. This locking screw can often be very difficult to undo and a few tripods have a quick-release system consisting of a circular or wedge-shaped metal block. The block is screwed on to the camera base using the tripod socket,

Two heads A pan and tilt head (left) has individual locks for each action. Ball and socket heads, on the other hand, are smaller and use just one knob to lock all movements of the camera



Tripod loaned by Leitz

Tripod loaned by Slik

Kim Sayer/Heads loaned by Leitz and ALCO



and the whole apparatus is then fixed into a recess on the tripod and locked into place by a lever or knob. A good quick release mechanism can make life much easier but a poor quality or worn device may fail to hold the camera rigidly. Since the main purpose of the tripods is to hold the camera rigidly, it may, therefore, be better to avoid cheaper tripods incorporating quick release heads.

Tripod heads are usually attached to a centre column which can be moved up or down through a boss at the top of the legs. On some tripods this column has teeth cut into one side and is raised or lowered by a small, geared crank handle. A non-geared centre column is moved simply by lifting or lowering the column to the appropriate height and securing it with the column lock. Crank handles, though convenient, usually prevent you inverting the centre column for copying, and low level photography.

Special tripods

If you cannot afford a full scale tripod it may be worth buying a miniature table-top version that holds the camera 20 cm or so above a surface. These are basic and can be very cheap and this is their main feature, along with ease of handling and portability, when viewed against full scale tripods.

One common type of miniature tripod has a hollow metal tube not much longer than a hand, with a ball and socket head at one end. When you unscrew the base

of the tube out come three legs, each pivoted to the base (often rather loosely). The legs unfold outwards and the base is screwed back into the main column to secure the legs. The height of these tripods is not adjustable.

Because of their size—when packed away the column is only about 10 cms high—table-top tripods can be carried anywhere. They can be placed on top of any convenient object such as a brick wall, a table-top or a car roof. The only limitation is that you must find something of the appropriate height on which to set the tripod.

Unfortunately, though relatively steady when set on a firm base, table-top tripods are not generally very stable. Any adjustment to the ball and socket must be made very carefully because they are very top heavy with the camera in place. A camera can easily topple over, especially if there is a long lens to help it over-balance. Nevertheless, the low cost and lightweight make these small tripods attractive alternatives.

A simple variation on the tripod is the monopod, sometimes called a unipod. This is really just a single tripod leg. Sometimes a tiny three-legged base is fitted in the base of the column and can be screwed into place when needed. More usually, it is stuck into the ground on a spike.

Monopods cannot give the steadiness of a tripod but they can often be used in situations where a tripod cannot. With a single leg, they are much lighter to

Safari family Long telephoto lenses are always difficult to use hand-held, and should be supported with a solid tripod whenever possible

carry and do not need a large, relatively flat area to stand on. If, for example, you were going for a walk over hilly ground where a tripod might be awkward to set up and cumbersome to carry, then a monopod could be a useful accessory. Some sports photographers prefer monopods because they can move the camera much faster to follow the action than they could even on the smoothest pan and tilt head tripod.

A firm base

Though a light tripod is easy to carry, it can sway with the slightest breeze or vibration, so it may be worth spending the extra effort and money on a heavier model which will provide a firmer base. Remember, though, that some tripods are heavy because they have many leg joints and their weight advantage may be offset by the greater chance of eventual unsteadiness and trouble following wear and tear on joints. So, your final choice will probably be based on a compromise between weight, size and ease of use.

Finally, whatever tripod you choose, you should use a cable release or other remote control device for shutter control to gain the full benefit from the extra steadiness. Used properly, a tripod can make a substantial difference to the quality and range of your photographs.

Dilip Mehta

Travelling the world on assignment for magazines such as *Time* and *Geo*, Dilip Mehta photographs everything from leading politicians to remote tribes

climates. We have a better rapport even if we don't speak the same language.'

The work that Mehta does for Contact is generally photoreportage and he covers news stories and political events for major magazines and periodicals throughout the world. Although he prefers to do more in-depth photoessays, Mehta enjoys photoreportage. 'You have to work at a very fast, concentrated pace. It teaches you to keep cool and in control of any situation.' Nevertheless, unlike most newspaper photographers who have to meet daily deadlines, Mehta generally has time to approach a news story from a number of different angles.

It was in doing general photoreportage for Contact that Mehta got his first big break. He was in India during the State of Emergency in 1977 when a national election was in the offing. Although he was completely unknown at the time, Mehta had his photographs used by *Time* maga-



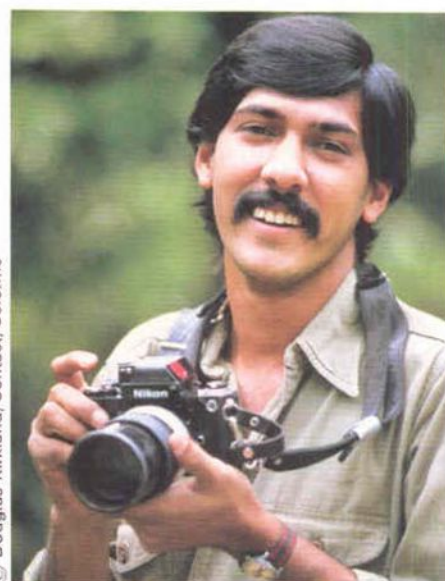
© Dilip Mehta/Contact/Colorific

For the successful photojournalist, travelling is a way of life, but Dilip Mehta gets around more than most. He may be photographing an exotic religious ceremony in Bali one moment and flying off to cover a news story the next. As a member of the New York based photo agency Contact, and as a regular contributor to *Time* and *Geo*, he has already circled the globe several times.

Each of Contact's eleven photographers choose to cover a particular

China scene Using an 85 mm lens, Mehta took this family portrait while waiting at a railway crossing at Hsu-sien

subject or area of the world. Mehta specializes in India and East Asia, though he also does assignments in other parts of the world. In his case the choice was obvious as, although based in Canada now, he was brought up in India. As he says, 'Coming from India, I understand the temperament of people who live in warm



© Douglas Kirkland/Contact/Colorific

Dilip Mehta Shot on location by Douglas Kirkland, one of Mehta's colleagues at Contact, the New York photo agency



© Dilip Mehta/Contact/Colorific

zine in eight consecutive issues, ending with the photojournalist's accolade: a cover picture, portraying Moraji Desai, who won the election.

This success made Mehta world famous. As he says, 'A photo credit for a *Time* cover is like a passport in photojournalism. Since that time my photographs have been used in magazines all over the world.' Recently, another accolade came his way when he won the coveted title of Canadian Magazine Photojournalist of the Year in 1980. This was for a photoessay on life in Bangkok.

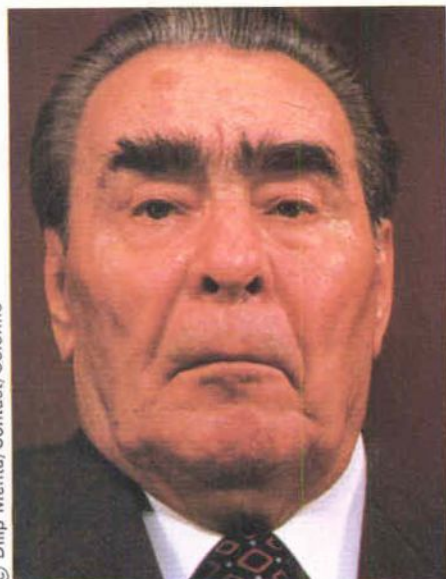
Mehta still prefers to do photoessays when he can. Because there is less pressure to meet deadlines with a photoessay, he has far more time to interpret the subject in his own way.

On these assignments he carries as little equipment as possible. Experience has taught him that he gets better results by concentrating on the world around him and carrying a wide range of equipment and flashy accessories would provide an unnecessary distraction. He learnt this the hard way when he left his original job as a graphic designer in Toronto and set off to take photographs on the Pacific Coast of Canada. He bought a secondhand Nikon with a 200 mm lens and a Pentax with a 50 mm lens and set off with 200 rolls of film.

'My mistake was in wanting all the glamour of being a photographer before I knew anything about taking good pictures. I dressed myself up in combat clothing like I had seen photojournalists wearing on TV, and I equipped myself with split prism filters, multiple image filters, starburst filters—all the gimmicks you see advertised in the photo magazines. After one month I returned to

Delicacies A beautifully composed shot showing some of the dishes that are characteristic of South Indian food

Devotees Thousands of Jains gather every fourteen years to celebrate the sacred anointing of the statue of Bahubali



Leonid Brezhnev A portrait of the Soviet leader, taken for *Time*, during his official visit to India in 1980

Toronto with the worst collection of photographs I have ever seen.'

Undeterred by the failure of this expensive trip, Mehta sat down and analyzed what had gone wrong. As a result he set off on another photographic trip to India, but this time he took just one camera. He is still justly proud of the portfolio he brought back, and which earned him his job with *Contact*.

This story demonstrates a major reason for Mehta's success at his chosen profession—a willingness to learn from his mistakes, and the confidence to talk about them afterwards. 'All photographers make mistakes occasionally, even professionals. We're only human beings after all, and mistakes are essential to our learning. They make you think



© Dilip Mehta/Contact/Colorific



hard and analyze where you went wrong, and sometimes they terrify you into being more careful the next time round.'

In photoreportage, however, there is rarely 'a next time round' and in these situations Mehta is usually to be seen with four camera bodies slung around his neck, each loaded with a different type of film. Lighting conditions may change rapidly in these situations and there is usually no time to change his film, especially when he is using a motor drive which he favours for photoreportage. This also influences his choice of camera.

He has four Nikon FEs and he finds their automatic settings very useful in rapidly changing situations when there is no time to meter the light. He also has the smaller Nikon FM which he calls his 'rainy day camera' because his FEs have a tendency to fail in the wet.

Mehta carries Tri-X film for his black and white pictures and Ektachrome 400 for use in poor lighting conditions. The other two cameras will contain Ektachrome 64 and Kodachrome 64. Magazines like the British colour supplements prefer Kodachrome because the quality of the colour is usually superior. But if a film is due to arrive at its destination only three or four hours before the magazine's deadline then it has to be Ektachrome because even *Time* doesn't have Kodachrome processing facilities.

The type of magazine that Mehta is working for will also influence the way in which he treats his film. 'Personally I like to underexpose Kodachrome and Ektachrome by half a stop, so that I get a little extra colour saturation. But if you are working for *Geo* you should underexpose even more, because the executive editor likes really deep saturation. *Stern* magazine is the same, but *Time* and *Paris Match* like you to shoot at absolutely normal exposure ratings. This isn't the kind of knowledge you can pick up by reading photomanuals; it is part of the folklore of photojournalism and you can only learn it from experience and from chatting to other magazine photographers.'

For a professional, Mehta has a fairly modest range of lenses, from a 20 mm to a 200 mm. He also has a 500 mm lens but rarely uses it because it entails carrying a bulky tripod. 'My favourite lens for reportage is the 135 mm—I really can't compliment it enough. I use it as my normal lens, and if I see something that needs closer investigation I'll move in with a 35 mm. The other lens I use frequently is the 180 mm *f*/2.8. It is ideal for close-ups of politicians, and I nearly always compose the shot as if I'm shoot-

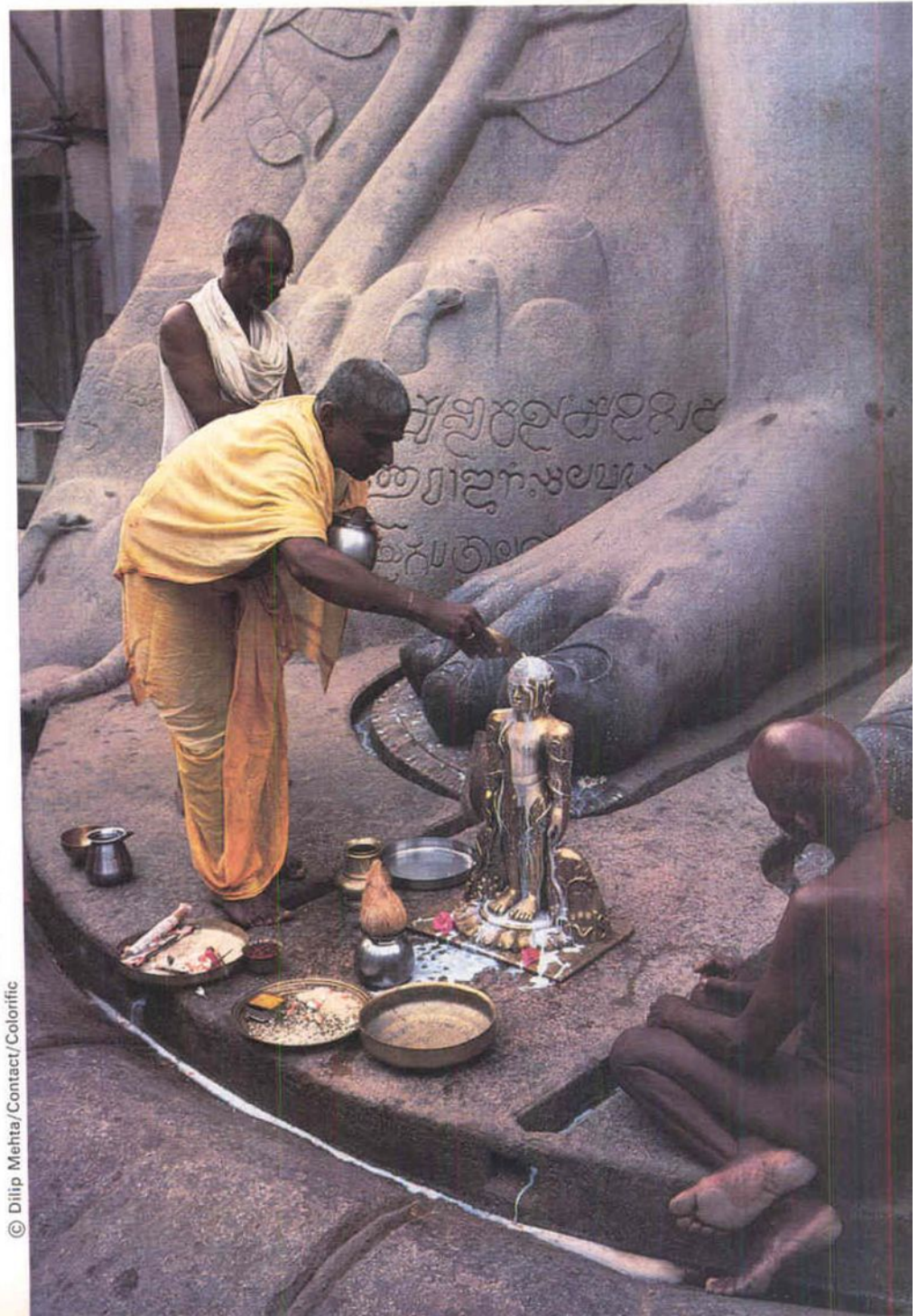
Royal swing This exotic shot was taken outside the royal suite in the Lake Palace at Udaipur for a photoessay on India's glamorous palace hotels

Anointing the statue Wealthy devotees at the foot of the giant statue of Bahubali bathe a tiny replica during a rare Jain festival in India

© Dilip Mehta/Contact/Colorific



Patterns of henna The gold-encrusted hands of a Sikh bride. Mehta took this for a *Geo* assignment on Kenyan Asians



© Dilip Mehta/Contact/Colorific

ing a magazine cover picture. I can almost see the letters T-I-M-E above the person's head'.

One of the problems that every photojournalist has to face is the fact that he is very often photographing misery and human suffering. The photographer has to ask himself whether he is willing to exploit the photographic possibilities of the subject or whether to become involved. Two close brushes with death have profoundly influenced his attitude.

The first occurred during an extended photographic study of the life of Sikhs in northern India. He was in Amritsar, the Mecca for all Sikhs, when two rival Sikh sects clashed and fifteen people were slaughtered. On the following day, Mehta travelled with the funeral procession. At first, he took pictures from one of the trucks, but then decided to

walk in the middle of the procession to record people's expressions.

'There was one young boy there whose expression was fantastic. I latched on to him, shooting very close with a 20 mm lens. The procession passed a police station and the youngsters started throwing stones. The police started firing their rifles in the air to disperse the crowd. Which is OK, except that you can't disperse a crowd of Sikhs. The boy I was with started running towards the police in some kind of hysterical rage, and pulled a policeman's rifle down quite roughly as though to say 'Hey, stop! Don't fire.' And the policeman, in a purely reflex action, pulled the trigger. I suddenly realized there was blood all over me and I thought that was it. Then I realized that it wasn't me but the boy. He had been killed instantly. A couple of inches more and it would have been me.

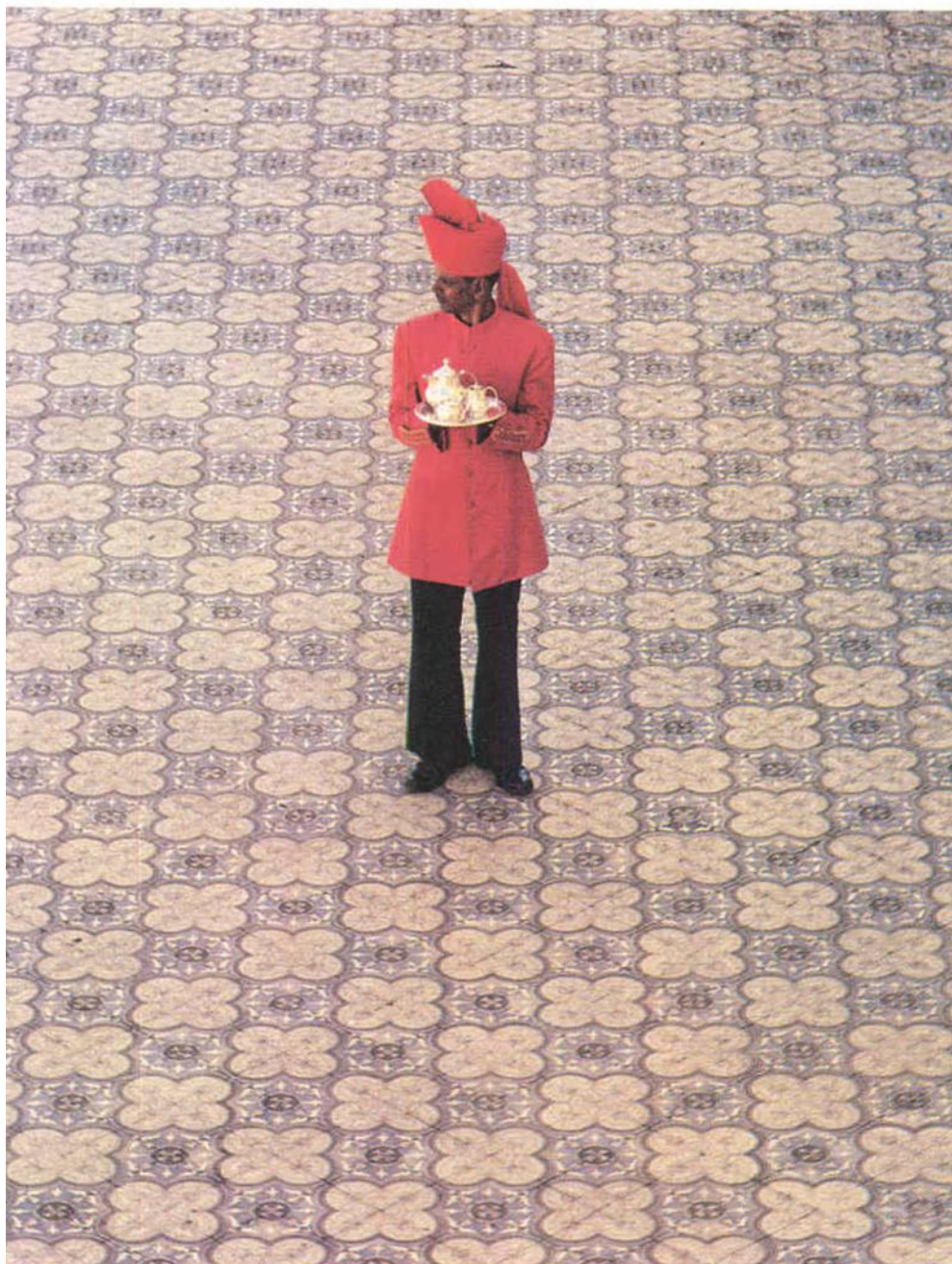
'That's where photographers are faced

© Dilip Mehta/Contact/Colorific



Catching a cobra The headman of the Irula tribe demonstrates the best way to catch cobras, minutes before Mehta had a sudden brush with death

Anyone for tiffin ? Mehta took this evocative shot from the second floor of the Lalita Mahal Palace in Mysore using a 180 mm lens to frame his subject



with a dilemma. Are you humane or are you a photographer? Of course, you're both. I put my camera down and tried to help him, but there was nothing I could do. So I started recording the images. It was horrific. There was blood all around. But when you get a camera viewfinder between you and what is happening, you immediately become a spectator.'

Mehta's second brush with death also took place in India when he was shooting a feature essay for *International Wild Life*. He was photographing the Irula tribe in southern India who make a living by catching snakes and frogs.

'The headman took me out on location one day to show me how they catch snakes. He was pounding the entrance to a burrow in the ground to bring the snake out, and I was standing behind it with my camera to my eye all the time so that I could get a shot of the headman when the snake came out.

'Well, it didn't, it came out of an emergency exit instead. I suddenly saw the ground explode right in front of me and, before I knew what was happening, a huge cobra swung right at me. Its fangs caught the rim of the UV filter on my lens, splattering it all over with venom. I was holding my camera quite far up and my body was far more accessible. I guess the cobra saw a reflection of itself in the filter and attacked that.

'I was terribly scared and decided then and there that death was the last thing I wanted. That's why I have no desire to photograph war and have my pictures credited posthumously. There is enough violence all around us in everyday life and I like to photograph some aspects of the way people live, not die.'

© Dilip Mehta/Contact/Colorific



World of photography

Nicholas deVore III

A self-styled photopropagandist, Nicholas deVore III has taken his camera all around the world from the mountains of the Himalayas to the tropical beaches of the South Seas

Nicholas deVore III has never allowed money to get in the way of his photography. If a subject is best photographed from the air, he thinks nothing of hiring a private plane for a few hours, even if it costs him the price of a couple of new cameras. It is not that he is exceptionally wealthy; he simply believes that as a photographer 'you have to think big to earn big.'

It is an attitude that, along with a mastery of his medium, has made him one of the most successful of all the American *National Geographic* magazine's photographers.

Even when he was an impoverished student at Colorado Mountain College, 2500 meters up in the Rockies, he would not allow shortage of money to stand in the way of his career. He spent what little money he had on a photographic trip to the Galapagos Islands and South America. This apparent extravagance paid off because it was the pictures from this trip that he showed to Robert Gilka, Director of Photography at the *National Geographic*, when he came to give a course at Mountain College.

Although many other students also met Gilka during his visit only deVore ended up with an assignment. His photo-



Nicholas deVore III

Lunch break *Nicholas deVore carving green sea turtle with an islander while on location for National Geographic in West Fayu, Micronesia*

Moose in the mist *This bull moose was photographed in the early morning mist at Kootenai Lake in the Glacier National Park of Montana in the United States*

graphs obviously impressed, but so did his attitude. 'We were asked to write a page description of ourselves. At the end of it I put, "I want your job". If I had not had that idea, I would have been like most other poor photographers.'

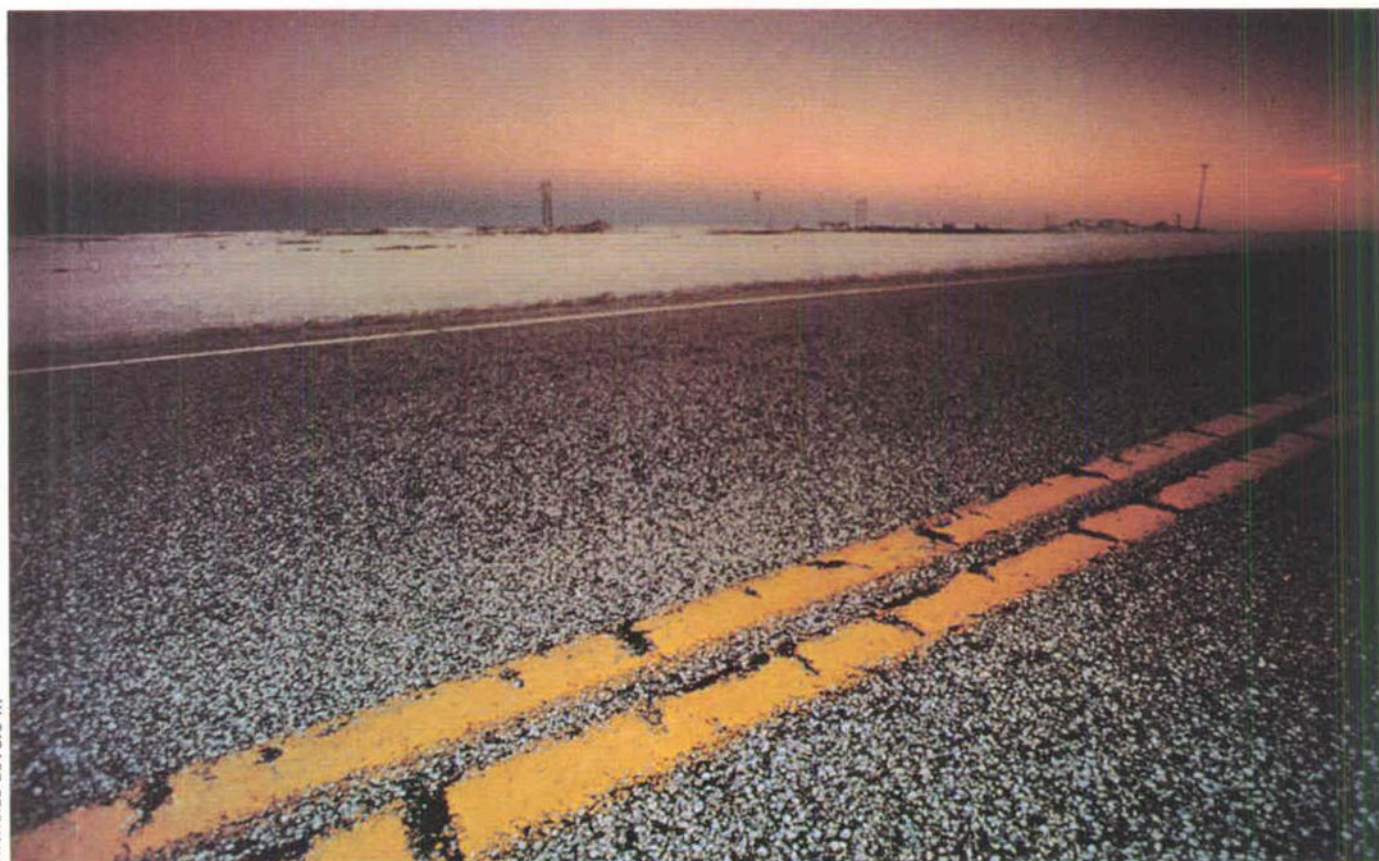
Three weeks later deVore was asked to take photographs for *National Geographic* covering a 40 day back packing trip in Wyoming. Although they only used two of his pictures, the contact had been made. Later while deVore was in Boston he telephoned Gilka to arrange a meeting. Gilka had been about to telephone another photographer to give him an assignment. 'He asked if I had my equipment with me. I had. "You want to go to work?" he asked. I got the job and spent three weeks photographing Cape Cod.'

When he had finished, he called the magazine again and Gilka asked if he would be interested in crossing the Sahara Desert in a land yacht. 'There I was in a windswept telephone booth on Cape Cod, and I couldn't believe my ears.'

Before leaving, deVore suggested a story on some orphaned shoeshine boys he had come across in Ecuador. The proposal was approved while deVore



Nicholas deVore III



On the road Shot out of a car window at sunset while travelling west over the Rockies. One of a series of deVore's more personal abstracts

Backpacker deVore spotted this hiker while climbing in the Sierra Nevadas. He took a light reading from the sky to achieve this striking silhouette



was in hospital recovering from a fire-work injury received during a Christmas Eve celebration in the desert. When deVore returned to the States he went straight to Ecuador for a month. After shooting that story he went to Quito and called the magazine again. 'How would you like to go and follow a British explorer across the Arctic Circle with an Eskimo dog sled?' asked Gilka.

This was the stuff boys' adventure stories are made of. But for deVore it was actually happening. 'I could hardly believe it. That day I flew to Washington, and then the following day up to the Arctic. There I was at 30° below zero wearing a giant fur coat and this incredible tan underneath.' His career was truly underway and ever since he has been working for *National Geographic* constantly.

National Geographic guarantees its photographers a weekly rate that depends on how long they have been working for the magazine and how experienced the photographer is. If the standard rate for any of the photographs they publish exceeds that amount, they will pay the difference. However, that rarely happens because the time allocated for an assignment is very generous.

Not all of deVore's work has been for the *National Geographic*. His work has appeared in *Geo*, Penguin Books and a wide variety of magazines as well as an exhibition at the Patricia Moore Gallery in Aspen, Colorado. He shoots many photographs for his own satisfaction but these are too abstract to appeal to a wide market.

He usually works in colour because black and white pictures do not sell very well. He also feels that colour can bring out the design of a picture far more strongly than monochrome. He uses mostly Kodachrome 64. If he needs a fast film he uses Ektachrome 400.

When it comes to equipment, cameras are very much tools of the trade, a means to an end. 'Photographers should concentrate on Arts and Humanities much more than f-stops and shutter speeds when they are learning their trade. It is taste that makes the difference. Because photography is a very technical medium with all the gadgetry, many people are so hung up about technique that they forget about picture-taking.'

DeVore himself has nine Olympus bodies, most of them the automatic OM2. He likes the small size of the Olympus, and automatic exposure is invaluable when there is no time for adjusting dials. 35 mm used to be deVore's main lens, though he has been through the whole range from fisheyes to huge telephotos. 'I'm now starting to use the 50 mm a lot more. I like the 50 mm 'realness' and I like the discipline that it brings to my photography.'

If any of his equipment fails, deVore does not hesitate to telephone New York from anywhere in the world to order replacements, even if it is new camera bodies. 'It is easier for me to buy brand new equipment than to worry about having it fixed in time for a job. If you are worried about nickels and dimes, how are you going to make dollars?'

He also believes in having other, less obvious terms of equipment. 'Photo-

graphers are always very quick to remember all their gadgets and paraphernalia, but they often do not bring a suit and tie. If you want to be invited to the ambassador's for dinner, you had better not show up with your hiking boots on.'

Because he does most of his work on location, often in adverse conditions, his approach is very different to that of a studio photographer. He prefers black camera bodies with black lenses. He paints over in black all of the wording on the cameras, even the serial numbers on the lenses.

'This makes the cameras much less obtrusive, more invisible than wearing all the crown jewels among the beggars. I use all my original thin black leather straps. I've gone through many cameras, but I always transfer the straps. I also wear dark clothing, to play down the way I look.'

Like his equipment, his picture-taking style is also unobtrusive. Instead of



Lonesome cowboys A father and son 'riding round fence' at their ranch. To isolate the figures, deVore used a narrow aperture and a fast speed

Porpoise Photographed off the Galapagos Islands, DeVore used 1/15 second shutter speed to instil a sense of movement in the picture



pointing one elbow in the air when taking vertical shots, he holds the camera so that both elbows are tucked well in. 'You don't scare little children that way. If you put your arm up, it's more of a threatening gesture.'

Rather than posing shots, he prefers to create a situation which will give him the picture he needs. 'It's like choreographing events so they happen the way you want them to. But it has to be something that would occur naturally. For example, I might suggest to someone that he takes his dog and rifle, and walks through a field. He might have done this the following week anyway, but it has to happen while I'm there.'

Yet when it needs to be, deVore's approach is direct, without being aggressive. He feels that there are many occasions when timidity can lose a potentially great shot. 'I offend some people because I'm too outlandish for them—but they are rarely ambivalent about meeting me'. Nor is he ambivalent in his attitude to life. 'I was a big game hunter for a lot of my youth. Deer were too easy so I went for elk.'

His enthusiasm for outdoor sports such as mountain climbing and skiing, help deVore reach those places which are inaccessible to most photographers. His childhood best friend, Jonathan Wright, died in an avalanche in the Himalayas when on an assignment for the *National Geographic*. DeVore was the obvious choice to replace him. 'I had a sense of going where my friend had died, and doing something which he would have very much liked me to have done.'

This kind of experience aside, deVore looks forward to all his assignments. 'That's one of the nice things about being freelance—we're asked to do a story rather than told. A staff member or someone on contract has to do pretty much what he's told.' Many of his experiences are physically disagreeable—in the Arctic his cheek stuck to his



Snowstorm Taken with a 300 mm lens from a hotel balcony. These skiers returning from the slopes were photographed at Steamboat Springs

Polynesian fare These exotic packages are typical of the food and drink carried by South Sea islanders on their voyages across the Pacific

camera and his hands were frostbitten, and he once sailed from Hawaii to Tahiti with 16 other men with just 440 square feet of deck space and little food. But, he really relishes most assignments. 'I'm not there to make money; I'm there to take great photographs, but my main concern is to have a nice lifestyle. I'm very self-indulgent.'

Still, after eight or nine years of feeling tired and hungry and missing his girlfriend, DeVore is ready for a change. 'I'm now more interested in urban sophistication. I like working with corporate executives and presidents. It adds another dimension to my career.'

He wants to move on from the restrictions of shooting for a specific market. 'I'm tired of red sweaters and pretty pictures,' he says, 'I'm more interested in how things feel and what they mean. One of my life's ambitions is to have a one-man show at the Museum of Modern Art—and to do something different.'

He also resents being placed into a

Hallucination A striking harlequin image captured at the Texas State Fair. DeVore used a fast film to achieve this grainy effect



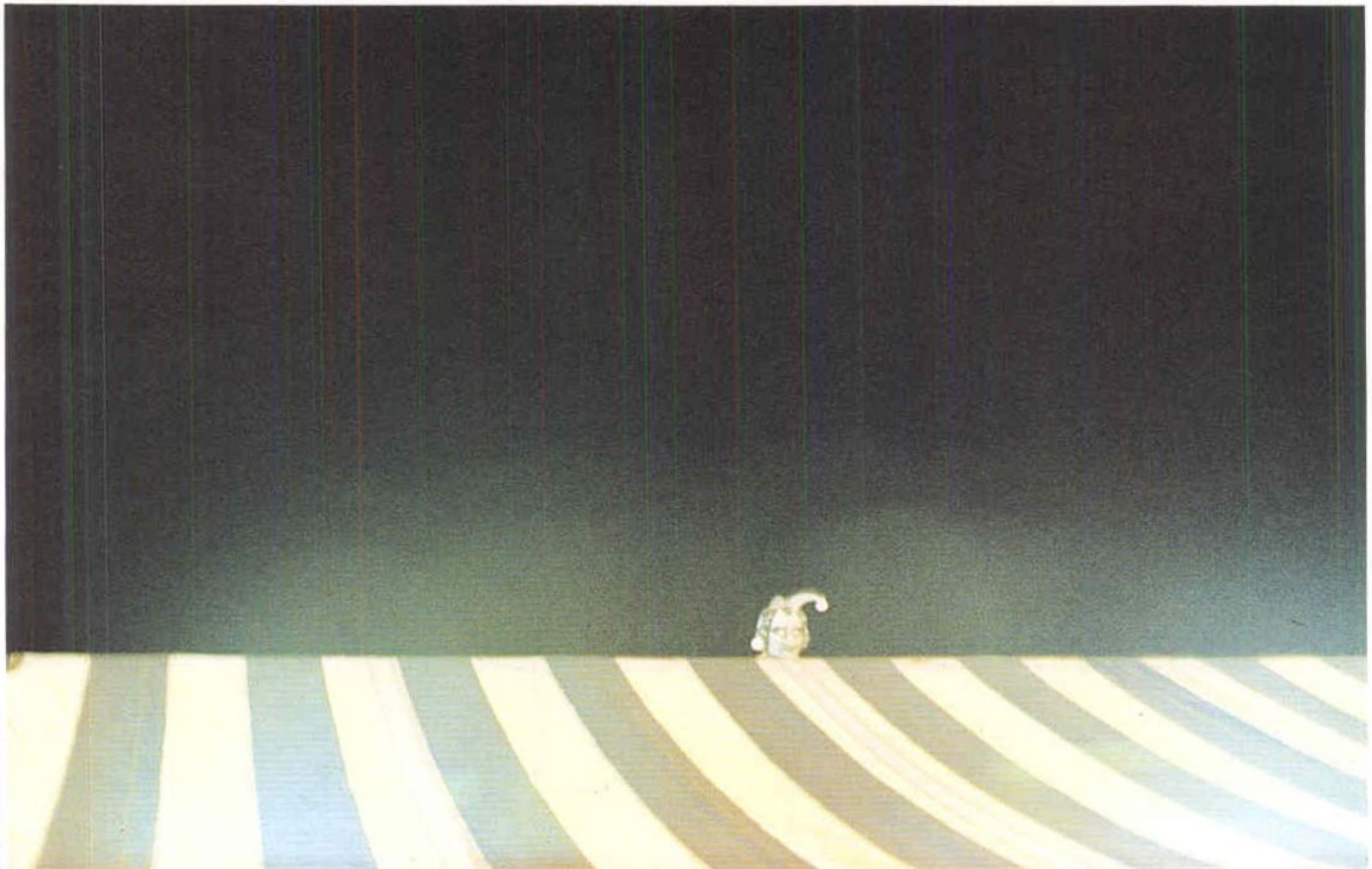
particular category by being called a 'photographer'. He considers himself more than just a photographer, although he makes his living at photography. 'Everyone with a camera can call themselves a photographer. I call myself a 'photopropagandist' because I'm quite embarrassed about being a photographer.' He wants to distinguish his work from the mundane commercial side of photography. He sees photopropaganda more as an art that can change people's views.

'A photopropagandist is a person who is involved in the art of photography in a broad way. It is more elevated than the

day-to-day competitiveness and pettiness of photography in general.

'Photopropaganda elevates the art to a more contemporary medium. A photopropagandist uses photography for reformation rather than just producing pictures that look nice.'

DeVore feels he has the education, background, personality, opportunity, and impetus to be one of the world's Cartier-Bressons. And that is what he wants to be. 'I don't want to sell out, or make babies and move to the country and be mediocre.' There seems to be little danger of this happening in the foreseeable future.





Compact cameras

As a first camera or as a pocket-sized alternative to the larger SLR, a 35 mm compact may meet your requirements, offering simple operation, small size and high quality pictures

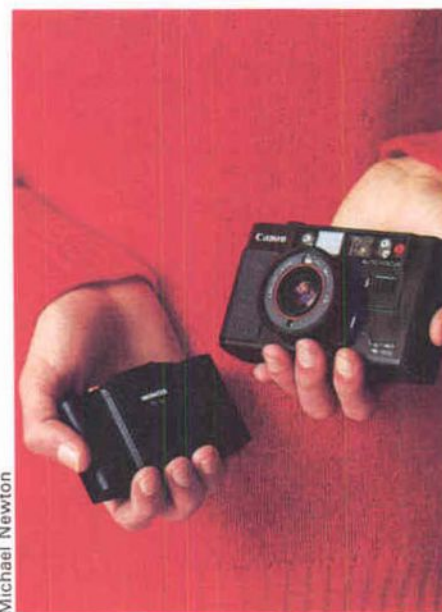
Michael Newton/Cameras courtesy of Canon, Rollei, TOE, Minox



As the popularity of the 35 mm SLR has soared, the serious photographer has tended to ignore some of the alternatives. Among the neglected breeds is the compact 35 mm camera. Yet the 35 mm compact is less than half the size of the average SLR and the performance of some of the better compacts can be extremely good. If you already own an SLR or a larger camera, a compact camera may be a valuable addition to your range of equipment—ideal for slipping into the pocket on those days when you do not want to carry a bulky SLR around. If you have no camera, a 35 mm compact may be a worthy first choice.

Most compact 35s weigh between 200 and 400 grams. This compares with 600 to 800 grams for the average SLR. So the compact is very light, but it is also small. The typical compact is about 110 mm wide, 70 mm high and 55 mm deep. An SLR, on the other hand, typically measures 145 by 100 by 100 mm. There are even smaller cameras on the market—the popular 110s and the 16 mm 'spy' cameras—some of which are no bigger than a matchbox. Unfortunately,

Size and weight *The smallest compact cameras are the size of a cigarette packet, and even the biggest is lighter than an average SLR*



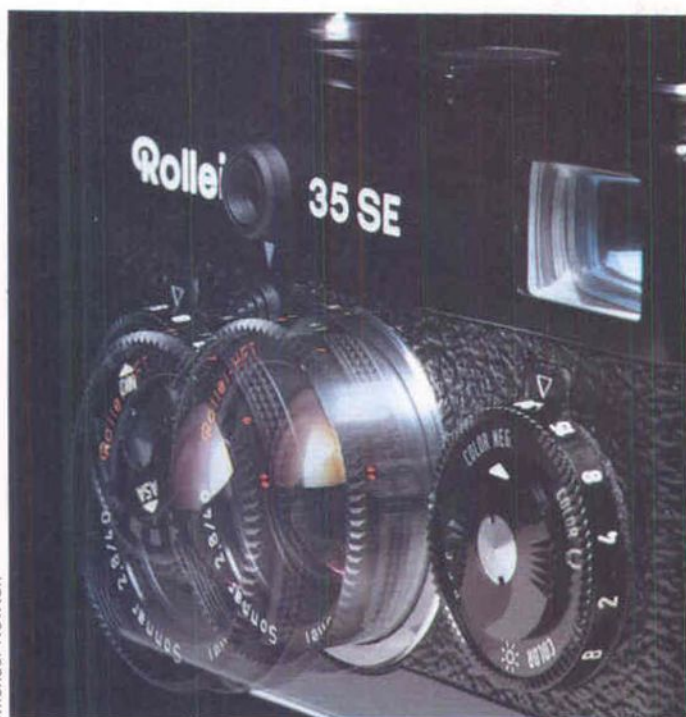
Michael Newton

Compact choice *The simplest of these cameras has scale focusing and no meter, but the most sophisticated is fully automatic, and even focuses itself*

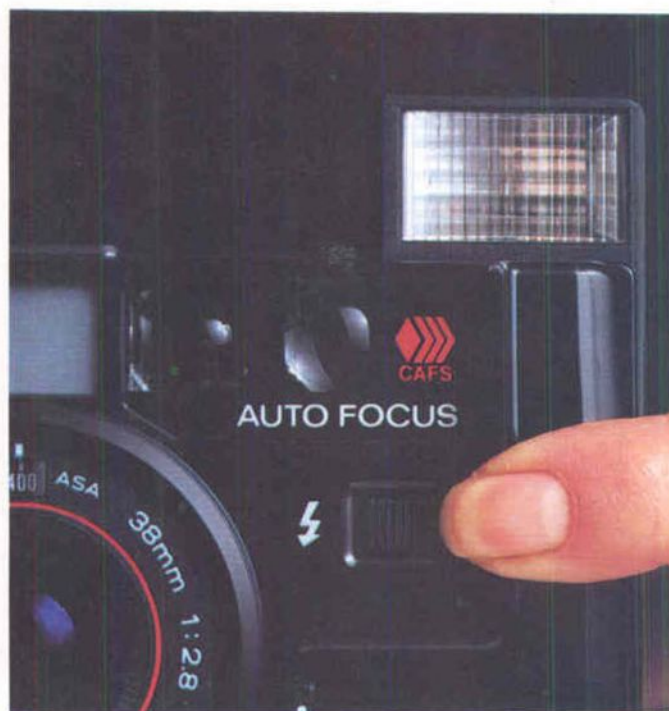
these miniature cameras take smaller film sizes which yield poor results when enlarged to any considerable extent. It can also be difficult to obtain transparency film for 110s and smaller. So, for the serious photographer, a compact that takes 35 mm film is a much better choice of camera.

Although there are some very sophisticated cameras towards the top end of the range, the majority of 35 mm compacts are fairly basic, designed for lightness and simplicity of construction and operation. Any refinements introduced are usually devices to make the camera easier to operate over a wide range of conditions. In fact, there are some compacts that not only have automatic exposure but also automatic focusing—all you have to do to take perfectly exposed, sharp pictures is to press the shutter release.

Nevertheless, there is considerable variation between the compacts on the



Collapsible lens The lens adds considerable bulk to a camera, and in an effort to save space, some manufacturers fit sliding lens barrels to their cameras



Built-in flash On this compact a flash tube pops up at the touch of a button. Although a separate gun gives better results, this feature is undoubtedly convenient

market. Some have only one shutter speed and one aperture setting, others have a full range. Some have automatic exposure, others have a built in light meter. The cheapest have no exposure guidance at all. But there are two important features which the majority of 35 mm compacts have in common: a fixed lens and a separate viewfinder.

The lens

Unlike the interchangeable lenses for SLRs, the fixed lens on most compacts cannot be changed to give different focal lengths. This simplifies construction and helps keep the camera small, but it considerably restricts its versatility. Nevertheless, this should not put you off buying a compact, as the standard lens should prove to be more than adequate for most situations.

More important is lens quality. This varies immensely from camera to camera. Pictures taken on the cheapest compacts are rarely good enough for very large prints. The better compacts can produce pictures as good as most SLRs. The only way to establish how well the lens performs is to test it yourself in the shop (see page 62).

On the compacts, the lens has a focal length of 30 to 40 mm, shorter than the standard SLR lens, and physically much smaller. A short focal length also gives a relatively large depth of field and a wide angle of view. The large depth of field means that focusing is less critical than on an SLR with a standard lens, but it can be harder to throw unwanted background detail out of focus even on cameras with variable aperture. The wide angle of view allows the camera to be used in fairly confined spaces but may

lead to unpleasant distortion in close-up portraits. Essentially, the compact is easier to use than an SLR, but is usable over a narrower range of situations.

Framing the subject

Most compacts have a very simple viewing system. The viewfinder is just a tunnel through the camera body fitted with lens elements to adjust the viewing angle to match the camera lens. Most viewfinders of this type have frame markings to show the scene that will actually appear on the film.

Like the fixed lens, the separate viewfinder has a number of drawbacks, but it is this feature more than anything that makes the 35 mm compact so much smaller, lighter and cheaper than the average SLR. Unfortunately, because the viewfinder is separate, you do not see quite the same area of the scene that is recorded on film. The difference is negligible when the subject is at some distance, but when you move in closer than about two metres, parallax error (see page 393) can be a problem. Although the subject appears to be perfectly framed in the viewfinder, the top of the head can easily be cut off in a portrait at close quarters.

To combat this, most compact cameras have small parallax compensation marks in the viewfinder. The subject must be kept within these marks to ensure perfect framing of close-ups. On the more expensive models, marks on the viewfinder are moved automatically to correct parallax error. As the lens is focused on nearby objects, the frame markings move across the viewfinder and down. This is a valuable feature but it adds much to the cost of a camera.

Focusing

Although with a relatively wide angle lens focusing is not so critical, most 35 mm compacts still need focusing. Since you do not see the view through the lens, you cannot focus by eye.

With the most basic cameras, the photographer estimates the distance to the subject and sets this on a scale around the lens. Sometimes the scale is calibrated with symbols showing typical subjects. A mountain represents infinity, and a head and shoulders indicates the minimum focusing distance of about two metres from the camera.

Although this sounds rather imprecise, it works quite well most of the time. Compact cameras are most often used in bright light at moderately small apertures, so depth of field is great, and focusing errors are less important. More care must be taken at wide apertures as there is less depth of field.

The better compact cameras are fitted with rangefinders that give very precise focusing, and a small but growing number of compact 35 mm cameras have automatic focusing combined with automatic exposure. This makes them exceptionally easy to use.

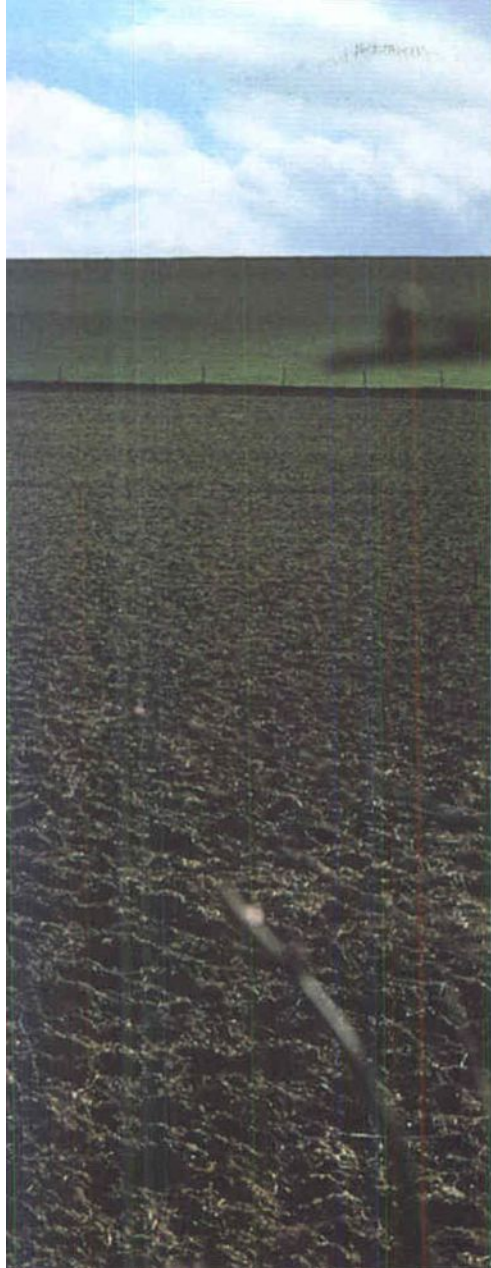
Two different automatic focus systems are available: one uses the contrast of the subject to focus the picture: the other uses an infra-red beam. Neither system is completely foolproof—the infra-red system cannot 'understand' windows, for example—but with most cameras it is possible to focus manually in situations where errors can occur. If there is no manual override however, there is little you can do to compensate, so it is worth looking for a camera with this facility if you buy an automatic.



Michael Newton



Michael Newton

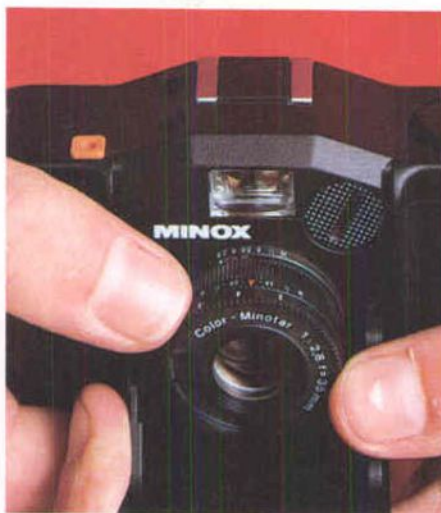


Compact colour You do not need the versatility of an SLR for snapshots, and many compacts are capable of excellent results if used with care. All these pictures were taken with a simple 35 mm pocket camera

Exposure

Just as automatic focusing is becoming more and more common, so is automatic exposure control. This is a logical move because the compact is an ideal 'snapshot' camera, particularly appropriate for candid photography, where ease of operation is essential. Nevertheless, manual exposure override is valuable to the serious photographer. Before you buy, examine the camera to see how much control over aperture and shutter speed settings it offers.

The simplest cameras have no adjustments to make, and these cameras only produce good pictures on a sunny day out of doors. Slightly more sophisticated ones have a fixed shutter speed but change the aperture automatically according to the lighting conditions. Even when there is no manual override,



Tiny controls With smaller compacts it can be difficult to make shutter and aperture adjustments quickly

you can deliberately 'fool' the camera by setting the 'wrong' film speed on the ASA dial and under- or overexpose for creative effect.

An alternative system adopted on a few compacts is a fixed aperture, and a shutter speed that changes to suit the prevailing light. These cameras can be fooled in the same way. In addition, they usually have a 'low speed' warning which indicates that a tripod or a flash should be used. This takes the form of a flashing or glowing light in the viewfinder which appears when the shutter speed is too slow to use the camera safely hand-held. Some cameras lock the shutter release in low light, thus effectively preventing wrong exposure.

The most sophisticated automatic cameras work in a number of different ways. Some have programmed automation, which gives a wide aperture and long shutter speed in low light. The settings are progressively changed as the light becomes brighter, until in bright sunlight a small aperture and fast speed is set. Other compacts set the exposure by shutter or aperture priority (see page 200) in much the same way as automatic SLRs.

The light meter on both automatic and manual 35 mm compacts rarely works through the lens, and is usually located near the viewfinder or close to the lens. Frequently, the light meter cell is mounted on the front of the lens barrel so that a filter screwed onto the lens will cover the meter as well, and exposure is automatically adjusted for the filter. If the meter is positioned so that it is not covered when a filter is used, however, you have to calculate the exposure change necessary and make manual adjustments to the controls if possible.

The shutter

Because they have fixed lenses, the shutters on compacts are usually the leaf or blade type, set between the elements of the lens (see page 110). Leaf shutters are simpler, cheaper and lighter than the



Easy control Slightly larger cameras often have bigger controls which you may find easier to operate

focal plane shutter of the SLR and they are much quieter in operation. This can be a considerable advantage in candid or wildlife photography when you do not want to attract attention.

The range of shutter speeds available on 35 mm compact cameras varies, some having only a single shutter speed and others a range as good as an SLR. Few, however, have shutter speeds of 1/500 second or more, and this limits their ability to freeze rapid movement. It can also be a disadvantage in very bright sunshine, particularly as few compact lenses will stop down beyond f/16.

At the other end of the range, i.e. compact camera is similarly limited as few have slow shutter speeds and many do not have a B setting. This means that the compact camera cannot be used in very low light conditions. Nevertheless, in practice, the range of shutter speeds is adequate for most situations.

Film speeds

With very few exceptions, compact cameras cannot be set to as wide a range of film speeds as SLRs. The fastest film speed setting is often 400 or 500 ASA. As with the limitations imposed by the shutter speeds, this limits the versatility of the compact but is rarely a serious practical problem. Some of the cheapest compacts, however, are not designed for films slower than 100 ASA and this means that slow, fine grain colour slide films cannot be used. It is important to ensure that the camera you choose can take these films.

Not many 35 mm compact cameras are as versatile as an SLR, but they are exceptionally easy to use. Light and simple to operate, and frequently totally automatic, they leave the photographer completely free to concentrate on taking good pictures. Compacts can perform as well as most SLRs, but they vary tremendously in both specification and performance, you should be careful to ensure that the camera suits your pocket and your particular needs.

Low light photography

At long exposures, film may not behave as expected. Although many automatic cameras are capable of giving exposures of a second or more, they will not necessarily produce correctly exposed pictures



Michael Evans/Colorific

For every lighting condition, there is a particular range of aperture and shutter speed combinations that gives the correct exposure. The relationship between each of the combinations in the range is normally a simple reciprocal relationship—that is, an increase in the shutter speed must be balanced by a similar decrease in the *f*-number to maintain the correct exposure. So, if you want to double the shutter speed to freeze movement—halving the exposure time—you must double the aperture. A one stop increase in shutter speed thus calls for a one stop decrease on the *f*-scale, two stops extra on the shutter speed dial calls for two stops less on the *f*-scale, and so on.

In normal bright conditions, this relationship, known as the *reciprocity law*, holds true and exposure adjustments are simple. As soon as the light begins to get dim, however, the reciprocity law no longer holds true, and doubling the exposure time

does not compensate for halving the aperture.

The practical consequences of the failure of the reciprocity law, known as *reciprocity failure*, are really only significant with very long exposures. When you use exposures longer than about half a second, for example, you must give more exposure than the light meter indicates.

The extra exposure needed varies from one type of film to another, but a typical black and white film needs a two second exposure when the meter indicates one second. This is equivalent to the speed of the film falling to half its rated value.

At longer exposure times, the fall in film speed is even more dramatic. If the indicated exposure for a night shot, for example, is 100 seconds at *f*/2, the photographer needs to hold the shutter open for 1200 seconds at *f*/2 to obtain a correctly exposed picture. This is equivalent to an extra 3½

City at night For long exposure shots like this, the shutter must be held open for longer than the meter indicates, and with colour film, for top results filters must be used

stops or to exposing a 25 ASA film as if it were only rated at 2 ASA.

Many modern electronic cameras are sold on the claim that they have light meters which 'give exposures as long as five minutes'. Such claims take no account of reciprocity failure, and photographers who try to take advantage of the low light capability of these cameras are liable to be disappointed—all the pictures would be underexposed unless special exposure compensation is given.

Long exposures colour

Black and white films are not the only films to suffer from reciprocity failure. When using colour film, the situation is even more complicated. Colour film has three separate layers of light sensitive emulsion, each recording a different colour of

light and each with different characteristics. In particular, each emulsion layer responds differently to low light. The red sensitive layer of the film may obey the reciprocity law down to one second, whereas the blue sensitive layer might fail after five seconds.

The result of reciprocity failure in colour films is that, as well as giving extra exposure, the photographer must use colour filters over the lens. Failure to do this will result in an overall colour cast to the pictures. The strength of this cast depends on the length of the exposure.

Exposure compensation

Each film responds differently to low light intensities, so it is not possible to make hard and fast rules about how much extra exposure to give. The accompanying chart gives general guidelines to

the extra exposure needed for black and white film, but it is only approximate. It is impossible to draw such a chart for colour films, and it is necessary to refer to the information published by film manufacturers giving precise details of the extra time and filtration that is required for individual colour film types.

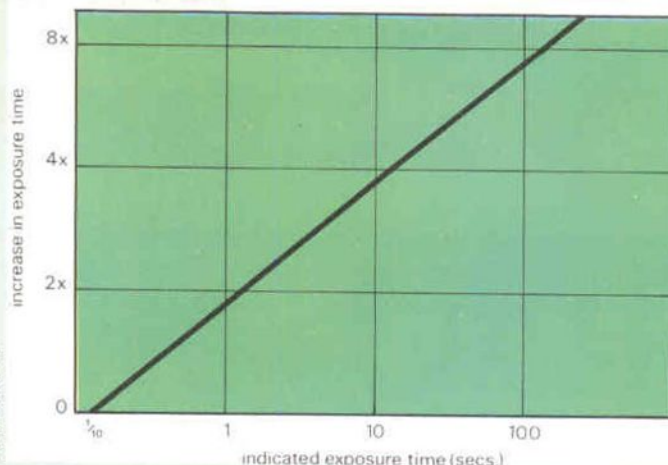
The extra exposure is indicated in three different ways. The first is a factor by which the indicated time should be multiplied. A factor of 3, for example, indicates that when a 5 second exposure is suggested by a meter, the true time is 15 seconds.

The second method is to show the exposure increase needed in *f*-stops. The 3× exposure increase would be shown as 1½ stops extra exposure.

The third method, given by some film manufacturers, provides different film speed rating for slow shutter speeds. Using this system, a 125 ASA film is rated at 45 ASA for the same five second exposure.

Colour filtration is given in colour correction filter values or CCs. CC 50 Y, for example, indicates that at a particular exposure, 50 units of yellow

Paul Williams



Reciprocity correction This chart shows the extra exposure needed by black and white films at slow shutter speeds. For colour films, refer to manufacturers' information

filtration are needed to correct for reciprocity failure. Filter values are standardized regardless of manufacturer origin.

Professional colour films, particularly negative films, are often available in two versions: type S for short exposures and type L for 1/50 second or longer. The colour balance of type L film remains constant for all times from 1/50 second to one minute, although exposure times still need adjustment.

Why does it happen ?

The reason for reciprocity failure is tied up closely with the way that individual silver grains are exposed. Light is composed of millions of tiny particles, called photons, and when the camera shutter is open, the film is bombarded with photons. If a grain of silver is to be made developable, it must be struck by at least four photons simultaneously. If photons of light arrive at the silver grains rather sporadically, as they

do in dim light, there is less chance that enough photons will strike the silver grains together to form a latent image. In bright light, the number of photons arriving is much higher, and easily exceeds the threshold level.

Very brief exposures

Reciprocity failure also occurs at the other end of the scale, when light is very bright and the exposure time is extremely short. The result is the same, and extra exposure must be given if the pictures are not to be underexposed.

In practice, the only time that such high intensity reciprocity failure is likely to prove a problem is with computer flashguns at very short distances. The circuit that regulates the light output of automatic flashguns according to the subject distance does so by changing the duration of the flash. When the subject is very close to the gun, the duration of the flash is sometimes as short as 1/30,000 second. Exposures as short as this can lead to underexposure and undesirable colour casts. The solution to the problem is to move the flashgun back from the subject.

Victor Watts/Photographs courtesy of The National Motor Museum



Short exposure At fast shutter speeds, colour is accurate but often you need to stop down to gain more depth of field, and long time exposures are required



Ten-second exposure Here the photographer gave extra time to allow for reciprocity failure, but did not add filters to correct the colour shift that occurs at long exposures



Creative approach

Cityscapes

Life in a major city covers a broad cross-section of human activity and offers an infinite range of photographic subjects. But think of a city as a landscape as well as a source of candid and architectural shots

When anyone mentions the word 'landscape', photographers naturally tend to think of the countryside and pleasant rural views. But some of the most interesting and dramatic landscapes are to be found within the major cities of the world—truly 'cityscapes'.

Applying to the city scene the same techniques and creative ideas that you apply to rural landscapes can produce some fascinating shots—try framing a city scene with cranes or old lampposts instead of trees, using a bus shelter instead of a farm gate as foreground interest, or using a telephoto to home in on the pattern of rooftops from a suitable vantage point. But the city is not attractive in the same way as the countryside and really needs a slightly different approach to bring out the best results.

City scenes, for example, rarely look 'pretty' in the accepted sense of the word and the kind of lighting that brings out the best in a rural scene rarely works in the town. There is no doubt that even the most aesthetically pleasing city can look unexciting in strong, direct sunlight or on a bright cloudy day. Although this sort of lighting may seem to be revealing and clear, it rarely conveys much of the atmosphere of the place. Unusual and dramatic lighting is often needed to prevent the cityscape appearing as a vast grey mass in photographs.

Striking sunsets, strong backlighting, heavy overcast skies and wet streets, misty mornings, moonlight—all these can help to transform the cityscape into something much more evocative. You can use a particular type of lighting to bring out the atmosphere of a particular city. Istanbul in Turkey and Venice in Italy, for example, are often photographed in the misty twilight before dawn or as the pale sun tries to break through the early morning haze. In the low sun and the mist, colours turn to rich pastels and outlines become soft and vague, enshrouding the scene with an air of mystery appropriate to these ancient cities. Such shots generally need an empty foreground, such as an expanse of water, to keep the effect two dimensional and vague.

The essence of a city like New York, however, is a modern glamour totally different to the fading glory of Istanbul and Venice. The Manhattan skyline, with its cluster of soaring office blocks, is instantly recognizable, but it needs the right lighting to look its very best. The misty atmosphere appropriate for

Venice rarely helps to convey the modern glamour of New York—the outlines need to remain sharp and clear and the colours bright. A clear, colourful sunset is ideal, particularly if you can get the rich colours of the sky reflected from some of the walls of the glass canyons. One popular way of photographing the Manhattan skyline is to wait until shortly after the sun has sunk below the horizon and make a long exposure. All the colour remaining in the sky glows rich and deep in the photograph and the twinkling city lights invest the scene with an air of glamour.

Although many cities benefit from the same treatment as Venice and Istanbul or New York, you should analyze what is

distinctive about each city. Try to identify the special characteristics of the city you are photographing and choose the lighting—and your viewpoint—to convey that special feel to best effect. If you find the city gloomy and depressing, wait for a dull wet day with heavy, overcast skies. If you find it warm and friendly photograph it under appropriate lighting. It would be a mistake, however, to photograph a city only in one kind of light and you should experiment with various times of day and changing weather conditions. Nevertheless, choosing a particular light provides a useful starting point.

Whenever you go to a new city, it is worth trying to find a spot where you

Rainy street Both the weather and the high viewpoint combine to produce this interesting shot. The atmosphere of the place would have been lost if the scene had been photographed at street level in ordinary light. **Manhattan skyline** This view has almost become the classic cityscape shot. Here, the clear winter sun with its warm yellow tone, adds highlights to the buildings.

Urban decay The contrast between the demolished houses and the modern blocks looming in the background is enhanced by the gloomy overcast sky. **Colour and pattern** Details of buildings, like these modern apartment blocks, make fascinating subjects



John Garrett



Vautier/de Nanxe



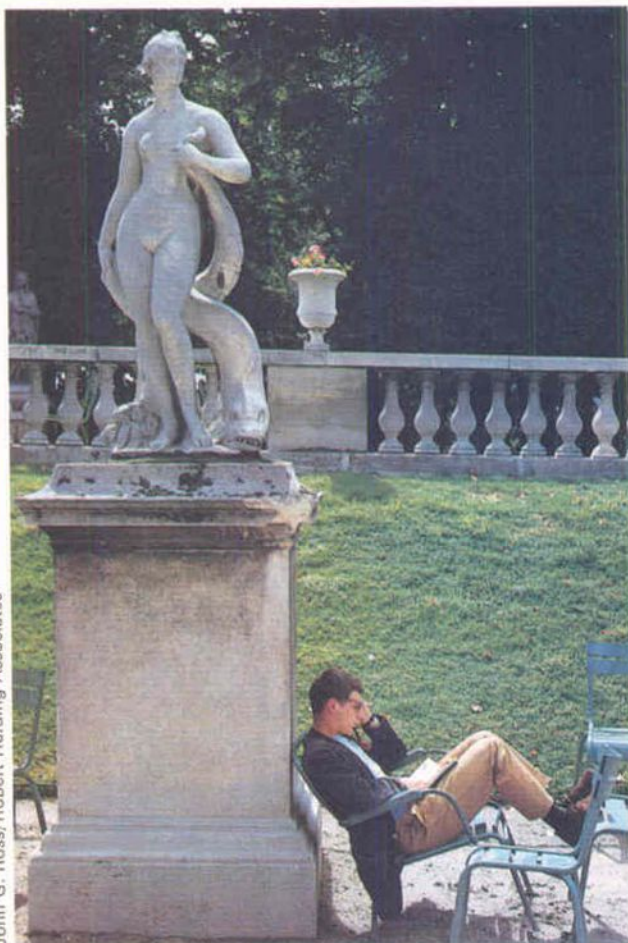
Vautier/de Nanxe



Patrick Thurston



John G. Ross/Robert Harding Associates



Don Hustein/Colorific



Patrick Thurston

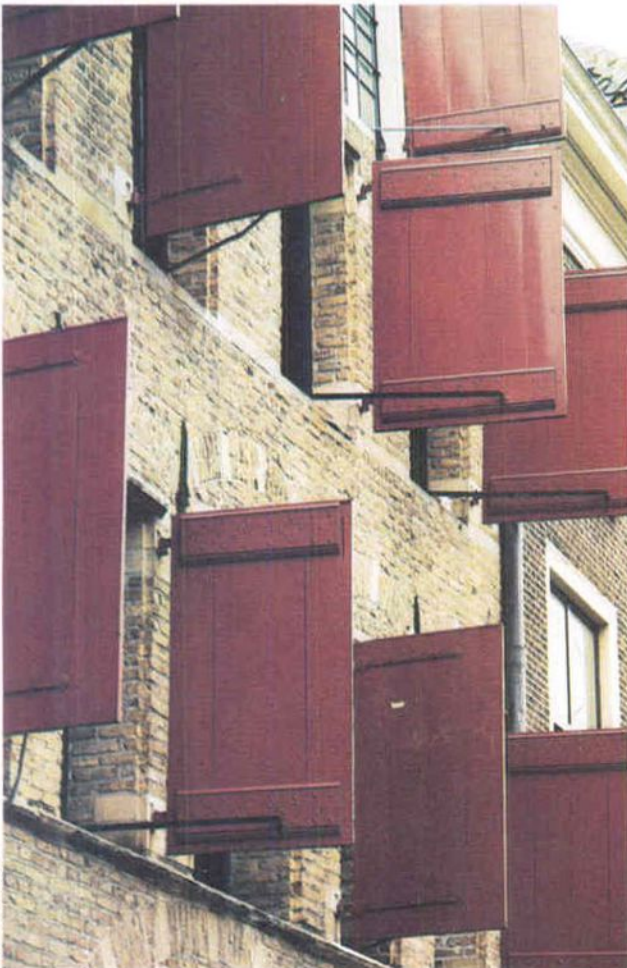


Edinburgh Castle Atmospheric haze can reduce detail in a composition, creating a simplified but effective image

Shutters Telephoto lenses are useful for compressing subjects together or isolating details, like these shutters

L'Arc de Triomphe Try silhouetting the familiar shapes of monuments against a colourful evening sky or a sunrise

Trevor Wood

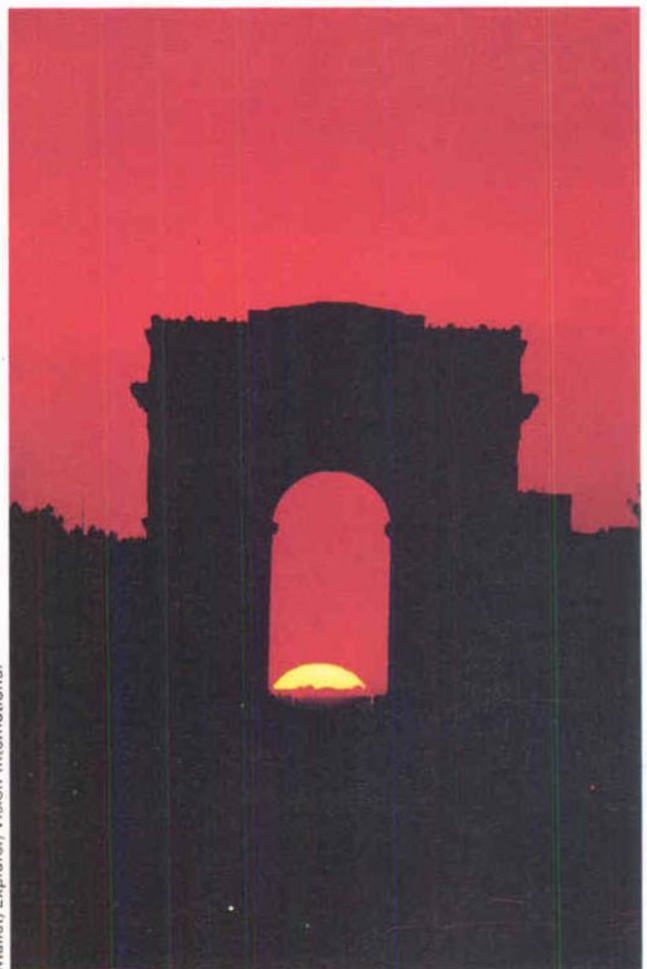


Washday Eyecatching details of everyday life, like this woman and her washing, abound in cities

Statue A light-hearted approach to an otherwise serious subject often works very well

Bird's eye view A high viewpoint can reveal interesting patterns in mundane subjects—here, parked cars

Mallet/Explorer/Vision International



can photograph the city from a distance. Even where the skyline or the pattern of roofs is not particularly attractive, a distant shot may provide a useful introduction to a series of more involved pictures.

If you cannot get far enough away from the city for a good panorama, look for a suitable hill or an accessible high building or monument.

Do not be tempted to pick the first building you see—plan the shots carefully and decide which would be the best part of the city to select. You may want to try several different buildings. Once you find a good location it is worth trying several approaches. Wide shots of the whole panorama can be most effective—the shape of the buildings, the scale, the patterns of the streets and the skyline can all contribute to the shot. Try and choose a day when the sky is clear and visibility is good. A polarizing filter is very useful on days like this. Early morning is particularly good because the air tends to be less polluted.

There are alternative ways of treating this type of shot. One approach is to choose dramatic light or weather conditions—a sunrise or sunset, a thunder storm or rain, for example. If you have to work with fairly unattractive conditions, you can try enhancing the colour of the sky by using a graduated filter. Shooting the same panorama at night is another possibility.

By fitting a telephoto lens and using the same high viewpoint, very different effects can be achieved. With a 200 mm or 300 mm lens (on a 35 mm camera) you can pick out details, creating patterns in the roof tops or finding closer views of the streets, the traffic and the smaller buildings. Alternatively you can direct the lens straight across to other tall buildings and fill the frame with more unusual and detailed views.

In the end, however, it is by moving into the heart of the city centre that you are most likely to capture the true flavour of the place. Although cities are full of people there are many other subjects that can be photographed. Bridges, rivers, canals, streets, details of buildings, shops and shopping centres—these are just a few of the subjects that are well worth looking at as sources of potentially interesting pictures.

For bridges, rivers and canals, do not look just at the waterfront, but look at all the waterside buildings and machinery. Look out also for more unusual shots—reflections, details of boats and other river traffic or the designs of the bridges.

When photographing buildings, look for small details—railings, patterns of stonework and windows, reflections and shadows. Examine how the buildings relate to each other and the patterns they create. Contrasts are also worth exploiting. It may be the old juxtaposed with the new, or corners of stonework contrasting with deep blue sky.

Try and include details that show the city as a changing, living entity, with people working, buildings being erec-



Malcolm Kirk/Daily Telegraph Colour Library

Neill Menneer

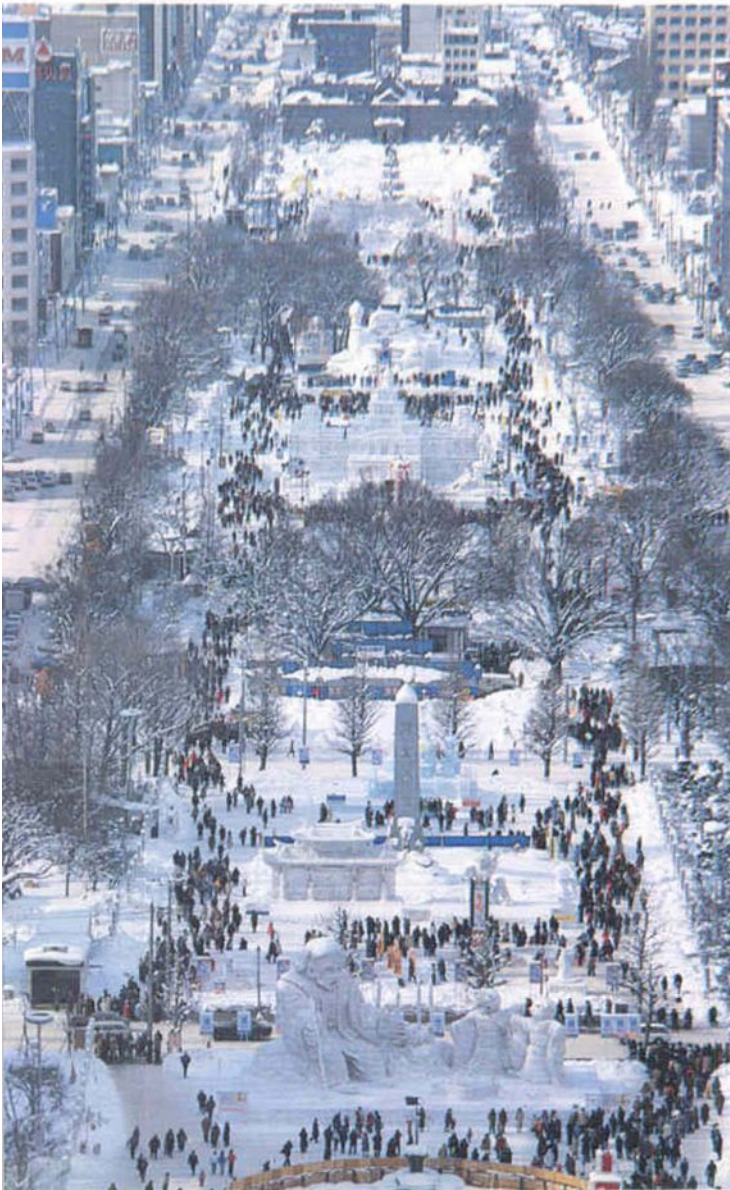


ted, or being pulled down. Look for signs of activity—a shot of a modern office block may become much more interesting if, for example, a window cleaner is included in the frame.

If you can, explore behind the scenes—up narrow alleys, round the backs of houses. With washing hanging out, and piles of rubbish, these areas may seem unphotogenic, but with careful framing they may convey the feel of a city far better than the famous buildings and busy streets.

The tourist attractions need not be overlooked, however—they can be reworked, rethought, given subtlety or humour. Ask yourself if the postcard view is the only worthwhile one. Try to think of new ideas. A famous monument can be photographed with builders repairing it, a man washing it, or tourists snapping it. Rather than a simple direct shot you could photograph popular scenes from their reflections on water or on shiny metal surfaces.

It is helpful to think in terms of a series of photographs. This could be an 'alternative' view of the standard sights, a set of shots of unusual shops and shop windows, activities in a city park, posters and advertisements, decaying buildings and wasteland alongside the modern—everything has possibilities.



Industrial scene *The contrast between this paper mill, the smoke-filled sky and the colourful houses provides several areas of interest and gives the shot its impact*

Rooftops *By finding a high viewpoint, you can not only shoot down on to the city but you can also focus on any subjects which are on your own level*

Shuttered windows *When composing a scene it is often very effective to combine several different elements—here the windows, washing and a circular railing*

Ice sculpture *This unusual structure, photographed in Sapporo, Hokaido, demonstrates that unique subjects can be found in almost any of the world's cities*

Peering eyes *A wide range of opportunities are available to the observant photographer in cities. The heads in this poster seem almost real because of the low viewpoint*



Steve Herr/Vision International

Distortion and diffusion

When printed normally, some pictures may produce disappointing results—but two simple techniques, distortion and diffusion, may help you obtain good images from poor negatives



ing verticals can be made parallel.

Although this is a very straightforward and easy technique to apply, it has a number of significant drawbacks. First of all, you will find that as parallel vertical lines in the image now converge towards the raised edge of the masking frame, so too do the edges of the picture. The print image is no longer rectangular but widens towards the top. This can be corrected fairly simply by setting the masking blades on the frame to the narrowest width at the raised end of the photograph. Obviously, some of the picture is thus cropped off, but this is rarely important.

A greater problem lies in ensuring that the whole print is in focus. Enlarger lenses have a narrow depth of field and you may find that even with a very slight tilt of the masking frame you cannot keep both the top and bottom of the picture in focus at the same time. There is very little you can do about this apart from stopping down the enlarger lens as far as possible to give the maximum depth of field. Effectively, this puts a limit on the degree of tilt you can obtain by this method.

To gauge the depth of field, focus the image about a third of the way down from the raised edge of the print. Stop down the lens, switch off the safelight and allow your eyes to get used to the low light level before making a visual judgement of the focus. With experience, you can usually tell how much you can raise the masking frame without areas of the print becoming unsharp.

Another problem is that image brightness falls off further away from the lens. This means that the raised edge

John Ward

Sooner or later, most photographers who make their own prints will want to experiment with special printing techniques. These have a variety of functions—they can produce stunning creative effects, they can be used simply to overcome deficiencies in the negative, and above all they can be very enjoyable to experiment with.

Two very different, but simple and useful, special techniques are distortion and diffusion. Each can be used to alter or improve the negative image—either subtly or dramatically.

Distortion

One of the most common faults in photographs of tall buildings is the phenomenon known as converging verticals. Unless you can stand sufficiently far away, the top of the building can only be included in the frame by tilting the camera upwards or using a wide angle lens. Whichever you choose, the result is apparent distortion of perspective in the final photograph. The building seems to narrow unnaturally towards the top as all the vertical lines in the scene converge.

By deliberately distorting the image during printing, you can compensate for this apparent fault and produce a more natural looking result. For normal printing, the negative, lens and print paper are held parallel to ensure that the print is sharp all over and to prevent dis-

Leaning cathedral Point your camera upwards and the inevitable result is converging verticals

tortion. However, just as the camera was tilted when the photograph was taken, you can distort the image to correct converging verticals by introducing the same tilt into the relationship between the negative and print.

There are various methods of achieving the necessary tilt and the method you choose must depend on the facilities at your disposal and the quality you are aiming for.

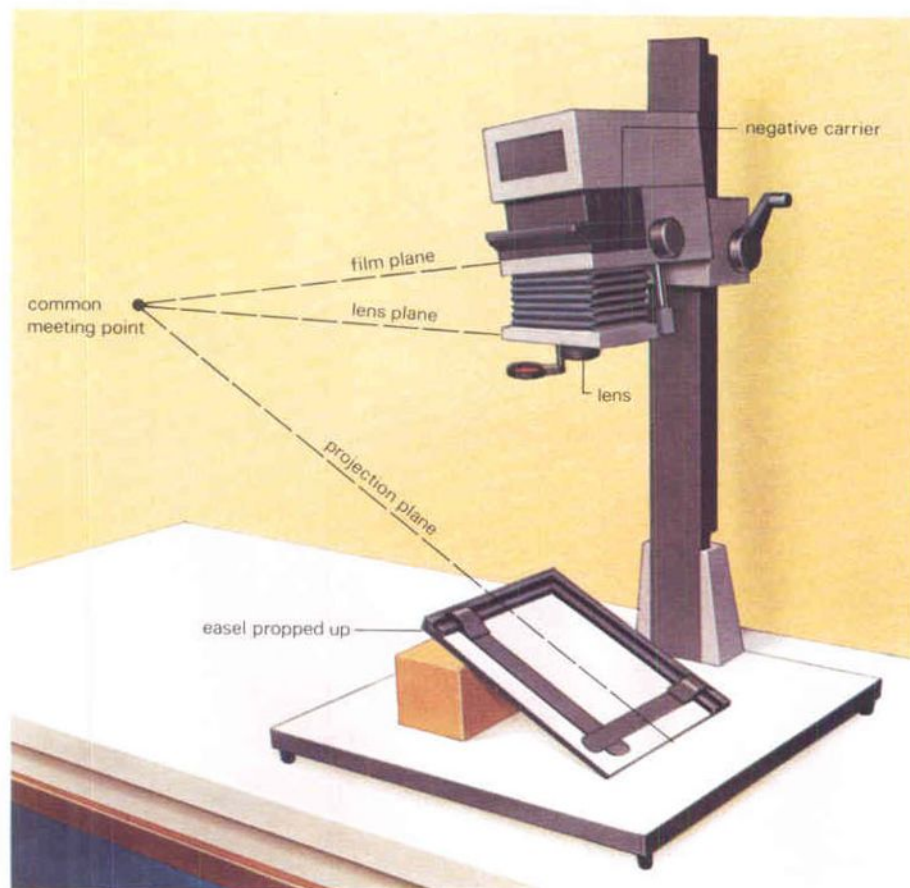
Tilting the frame

Undoubtedly, the easiest method is to tilt the paper by propping up one side of the masking frame or easel. The raised side of the paper is thus brought nearer to the enlarger lens. Because the image gets larger the further it is away from the lens, areas of the image projected on the part of the paper that is lower are larger than those on the raised part. Thus, by raising the masking frame along the bottom edge of the photograph, you can change the vertical perspective so that vertical lines diverge towards the top of the picture. In this way, converg-

Progressive exposure Use a sheet of opaque card to shield the print progressively during exposure when correcting converging verticals



Advertising Arts



Full correction *The sharpest image is assured if the paper, lens and negative axes meet at a common point*

Corrected verticals *Using the above method it is possible to correct the convergence, but cropping is needed*

of the print needs less exposure than the darker lower edge. To keep print density even, therefore, you must cover the print progressively during exposure, starting at the raised edge and moving down evenly until all the print is covered. This may sound a daunting prospect, but it is usually quite straightforward.

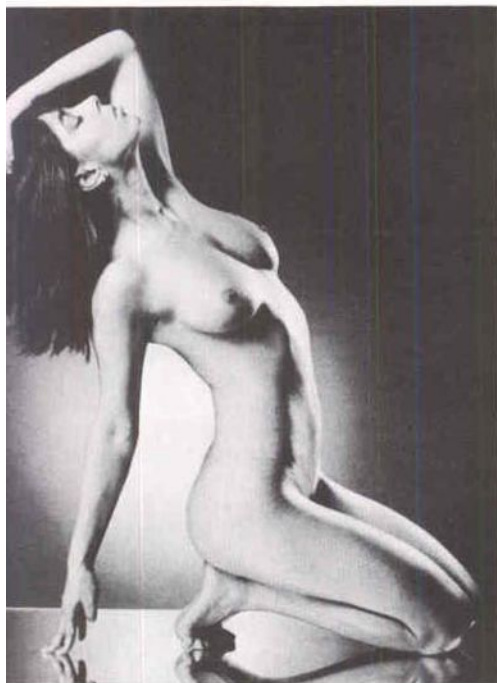
Before you make the exposure for the full print, you must determine the exposure needed for the top and bottom edges of the print with the aid of test strips (see page 164). The exposure time for the lower part of the print will be longer than that for the raised edge of the print and this longer time should be your total exposure time.

Make yourself a card mask large enough to cover the entire print area and have it ready in hand. Start the exposure in the normal way. When the exposure time for the raised edge is up, begin shading the print down the slope. Keep a close watch on the clock and move slowly and evenly to reach the bottom of the print at the full exposure time. It is worth having a couple of practice runs without any paper in position but, fortunately, with long exposure times with the lens stopped right down, timing is not that critical.

Tilting the negative

Although it is a relatively simple method, tilting the masking frame clearly raises problems and you may get better results by altering the alignment of the negative and lens as well—if your enlarger has this facility.



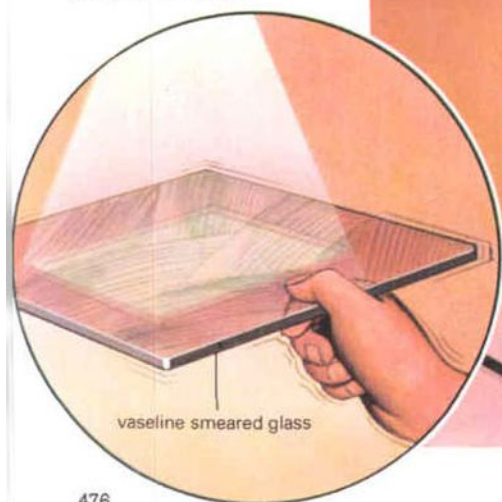


Peter Cogiam

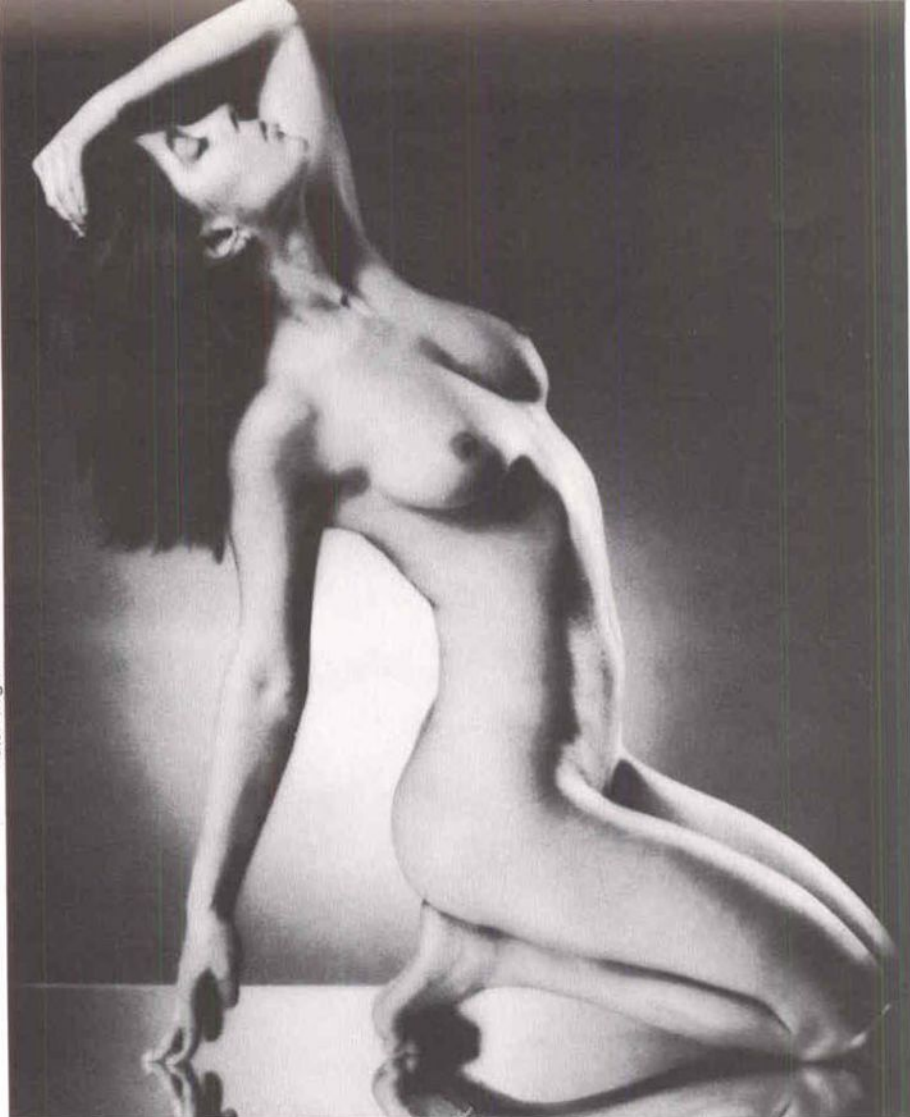
Contact diffusion By placing a sheet of quality tracing paper under a sheet of glass and over the print for the whole exposure, a subtle, all-over and easily repeated diffusion effect is possible. The image also remains well defined and reasonably sharp

Even on the most basic enlarger, you can generally tilt the head. This has precisely the same effect as raising one side of the masking frame, since both lens and negative are set at a slight angle to the baseboard. On some enlargers, however, you can keep the lens almost horizontal while tilting the head so only the negative is tilted in relation to the baseboard. On sophisticated types the negative carrier can be tilted independently. Most effective of all is to tilt the negative, lens and baseboard so that the axes of all three meet at the same point.

Diffusers Netting, plastic sheet and glass smeared with jelly can be used for diffusing the projected image



vaseline smeared glass



The result of this method is more precise and the entire projected image remains sharp. You must remember, though, that even with this technique image brightness falls off towards the far edge of the print and you must shade the image progressively during exposure in the same way as you would if the masking frame were tilted.

Distortion for effect

Although the main use of the distortion created by altering the negative, lens and print alignment is to correct converging verticals, it can be used to produce a number of special effects. You can, for example, slightly elongate a rather rounded face to make it look more attractive. Or you can 'stretch' a face right out for an amusing result. Alternatively, you can turn a tall, lanky person into a dwarf or make a high, narrow car look wide, low and powerful.

Even more interesting effects may be obtained by bending the paper. This can only be done to a limited extent without damaging the emulsion surface, but if you are interested in experimenting, try using pins and tapes to form waves and troughs on the print surface. But remember, the more you distort the image, the harder it is to keep it sharp and evenly exposed.

Diffusion

Most photographers achieve soft focus effects for landscapes and portraits in the course of taking the pictures (see pages 93 to 97), but there is no reason why you cannot achieve similar results in the darkroom. All you need is a home-made diffusing screen, held beneath the lens, or laid directly on the print, during part or all of the exposure.

Paul Williams

Peter Cogram



Distractions This picture, taken under unusual lighting and printed normally, is harsh and contains distracting details



Improvement A far better picture is obtained by diffusing the whole area of the image apart from the face

A diffusing screen need not be elaborate. It can be made from any transparent or semi-transparent material. Black nylon stockings can be stretched tight over a wire frame, for example.

A sheet of glass, with taped or smooth edges, can be smeared with varnish, lacquer or petroleum jelly to create far more elaborate diffusion patterns than are possible with the same technique used on the camera lens (see page 96). You can diffuse precisely those areas of the picture which you want vague while keeping the rest sharp.

By varying the material you use for the screen, a whole range of different effects can be produced. Varying the height of the screen above the print or removing the screen during the course of exposure may give similarly interesting variations.

Whatever you decide to use, make a test print to determine the exposure. If only some parts of the picture are to be diffused, you must make a test for each area. It is usually better to underexpose the diffused part of the image slightly because the shadows tend to encroach on the highlights as exposure continues—while diffusion at the picture taking

stage tends to create a light, misty effect, diffusion during enlarging generally darkens the print.

Although not always as attractive as a diffused image produced in the camera, an advantage of softening at the enlarging stage is that you have a sharp negative that you can print both normally or diffused as you wish. Indeed, diffusion during enlarging can sometimes be used to rescue poor negatives. You can disguise slight surface scratches, an

obtrusive grain pattern or even unsightly skin blemishes in portraits. By adjusting the area covered by the diffusing screen it is possible to diffuse anything from the whole print area to just a small part of it.

Both diffusion and distortion are techniques which, in some way, degrade the negative image so they should be used sparingly. But with care and a good deal of imagination, they can open up a new world of creative possibilities.

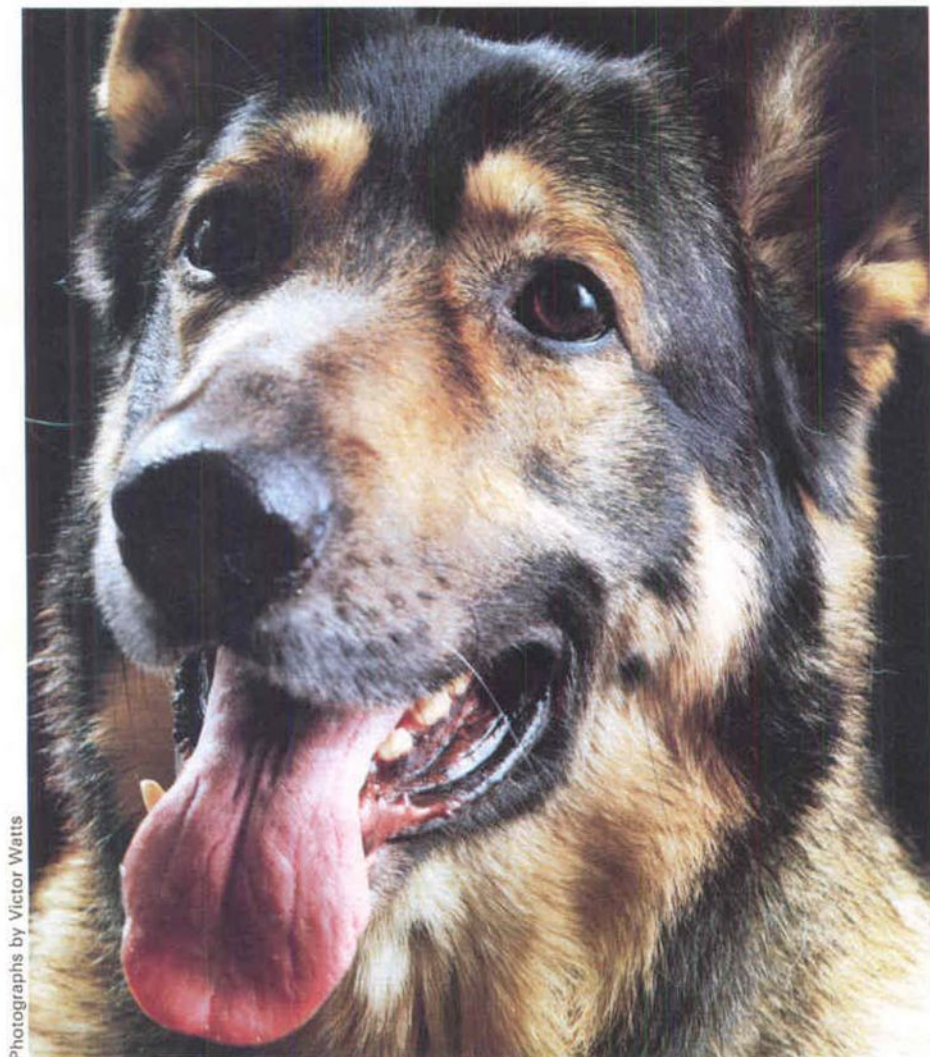
Improving portraits Diffusion at the enlarging stage is especially useful when you have to print an attractive portrait from a rather unflattering negative. Sometimes it is impossible to play down the effects of harsh lighting in any other way



Peter Cogram

Your dog

Photographing a dog may seem like an easy exercise but when Victor Watts tackled the assignment he found enough problems to tax his ingenuity



Photographs by Victor Watts



One of the main problems involved in photographing a dog, or any other pet for that matter, is making the subject do exactly what you want. This is just what Victor Watts found when he was asked to spend a day photographing 'Scott'. Fortunately, he had some help to see him through—including Scott's owner who could attract the dog's attention when necessary.

Starting with an indoor shot using three studio flash packs and a black background, Victor tried to set up a portrait which would capture Scott's character. Still inside, Victor also tried a couple of humorous poses—one of the dog peering around a door and another of him standing next to a picture of a distant cousin.

As Victor explained: 'You have to think carefully about finding different shots to add variety to the series and to





Indoors Victor used large Bowens flash units, each fitted with an umbrella. The portrait was taken with a medium format camera for maximum sharpness and a 35 mm camera was used for the others. The owner stood behind the camera to attract Scott's attention and draw him towards the camera

Outside A favourite stick and Scott's owner were instrumental in setting up and controlling action shots like this. Victor pre-focused on the spot where Scott was likely to jump, and used a 300 mm lens to separate the subject from the background. Even so, plenty of 'takes' were needed



achieve something unusual. After that, the problem is to convince the dog to cooperate—for this, having the owner around is absolutely essential.

Indoors, Scott was understandably wary of the activity—the lights, the cameras and the unfamiliar people. Outside, the problems were different. The overcast daylight forced Victor to use slow shutter speeds and wide apertures. This led to problems of focusing accurately and holding the camera steady. Using a tripod helped but it was still difficult to keep the lens focused sharply on the subject because Scott was constantly moving about. One problem of using a wide aperture was that there was not enough depth of field to keep the eyes and the long nose in focus—especially when a telephoto lens was used. For close shots, a small aperture is essential.



Improve your technique

Using medium telephotos

Sharpen up your photographic eye with a medium telephoto lens.
This important range of lenses can help you to close in on vital
detail and give your pictures much greater impact

Versatile, easy to handle and with extra 'reach' for long distance shots, the medium telephoto (with a focal length between 85 and 200 mm) is an immensely useful lens. For many photographers it is the first major addition to their range of equipment. But to get the best from such a lens, you must learn to use it selectively and adjust your technique to suit its particular characteristics.

The medium telephoto lens differs from the standard lens in a number of ways. Most obviously, it provides a larger image, magnifying distant subjects and making them appear closer. While it is possible to photograph equally distant subjects with a standard lens and then enlarge them to a similar size at the printing stage, the quality is

not usually so good. In many situations where you cannot get very close to your subject, then, it is worth using a medium telephoto. A long telephoto gives an even larger image, but can create serious handling problems.

Where the subject is moving about, accurate framing can be difficult and for sports photography, many photographers find a 200 mm lens the ideal compromise—anything much shorter usually has insufficient reach. At a football match, for instance, you definitely need some form of telephoto for action shots if the players are not to be lost in a vast expanse of green. But to avoid missing the precise moment when the ball leaves the player's foot on the way to goal, you have to follow the action in

the viewfinder, moving the camera with the flow of play. With a long telephoto, this is more difficult.

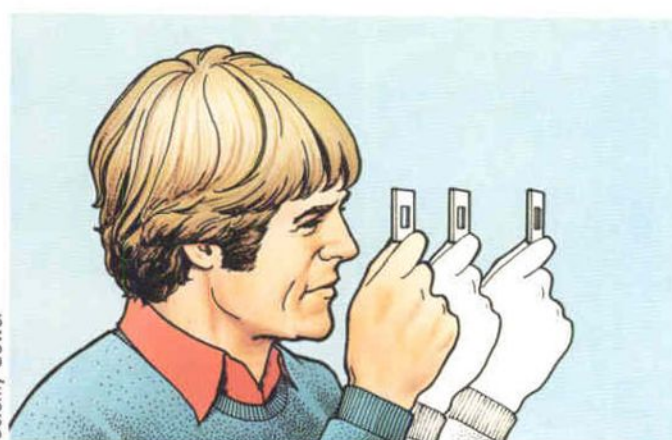
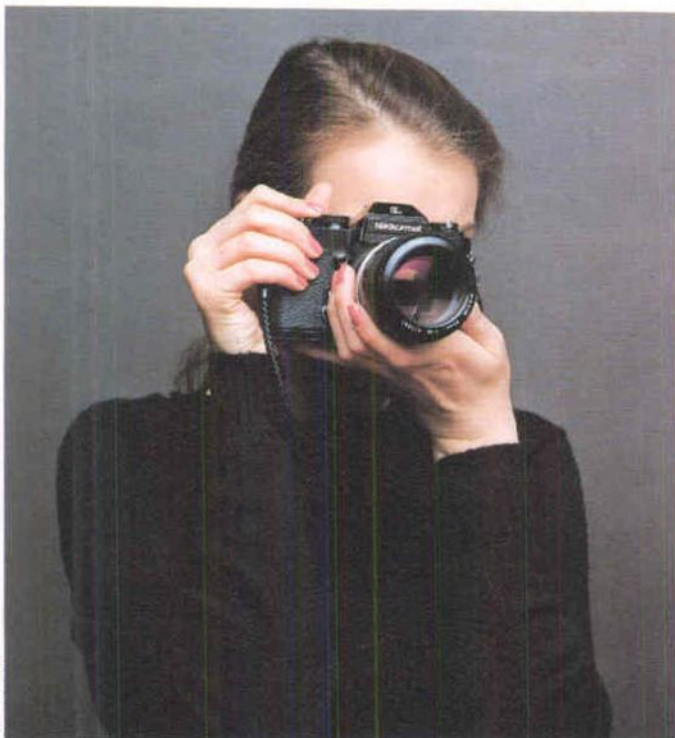
Nevertheless, the medium telephoto can be invaluable for bringing even static subjects closer. Some photographers like to use a medium telephoto for candid photography because they can shoot from a distance and remain unobserved by their subject. Unfortunately candid shots on a telephoto tend to look rather distant, as indeed they are.

For wildlife photography, however, a medium telephoto may prove useful.

Village girls The elaborate head-dress and delicate features of two Pakistani girls were captured by a 135 mm lens



Julian Calder



Focal lengths
Estimate the angle of view of a lens by holding an empty slide mount at the same distance from your eye as its focal length

Camera grip
Cradle the lens in your palm

view of the photogenic old lady chatting in the street.

Another situation in which the narrow angle of view of the medium telephoto can be valuable is when shooting towards the sun. With a wide angle or even a standard lens it may be difficult to exclude the sun from the frame and still keep your subject central. This can cause tremendous exposure problems (see page 364). By using a telephoto, you may have a sufficiently narrow field of view to include only your subject and not the sun.

You can only assess precisely what the telephoto's angle of view is with the lens actually in position on the camera, but to avoid changing lenses unnecessarily you can make a rough estimate with a slide mount. Close one eye and hold a slide mount in front of the other eye. When the slide mount is 85 mm from your eye, the view through the mount will be the same as that given by an 85 mm lens. The same applies to other distances and lens focal lengths.

One effect of telephoto lenses, which is not always appreciated, is the apparent flattening of perspective. A wall seen

Again a long telephoto provides larger images and for the ornithologist particularly this may be valuable, but for larger creatures than birds, a medium telephoto may be better. Indeed, on safari where you are frequently shooting from a moving vehicle, or following a moving animal, a medium telephoto may be the most useful lens to have on your camera—especially as it will often allow faster shutter speeds to be employed than a very long lens.

Because of their magnifying effect, there is a tendency to treat any telephoto lens simply as a telescope for the camera and to use it only for distant subjects. But this is not the only use for a really long lens and limiting a medium telephoto in this way is wasting its potential for particular effects with nearby subjects.

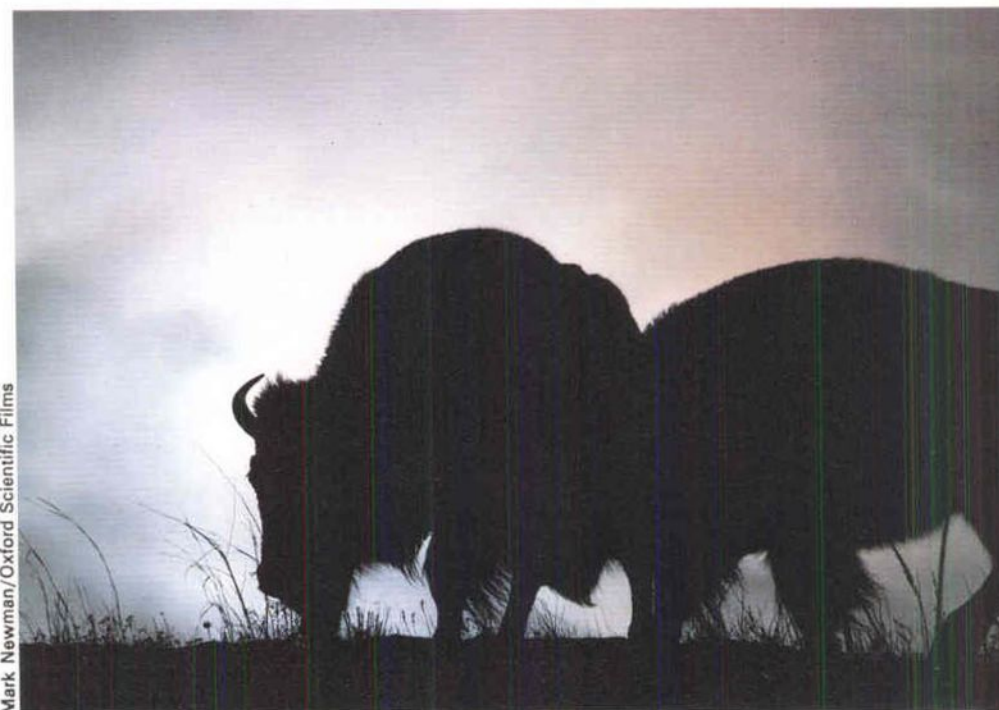
Since the telephoto produces a larger image, it is also useful for filling the frame properly. Even for a relatively close subject, the standard lens may include large areas of unnecessary, and maybe distracting, background scenery.

A shot of the bride stepping into the car, for instance, may be more effective if you can use a medium telephoto to close in on the face—even if you are standing less than ten metres away. Many press photographers use this technique to get good strong head-and-shoulders pictures of famous people in situations where they cannot stand quite close enough to get the desired framing with a standard lens. A lens much longer than 200 mm would probably include too little of the subject and is awkward to handle—a 135 mm lens is perhaps ideal for this particular situation. But any

medium telephoto can help ensure tight framing for a wide variety of shots.

Associated with its larger image, the telephoto lens has a narrower angle of view than the standard lens. While the standard lens takes in about 45° of the scene before the camera, a 100 mm lens sees only 25° and a 135 mm lens sees just 20°.

This narrow angle of view can be very useful in certain situations. If you are shooting in a crowded street, for instance, it can be difficult to exclude unwanted objects from the frame. By using a medium telephoto, you may be able to aim the camera between the lamppost and the parked car and obtain a clear



Bison With deliberate underexposure, a 200 mm lens gives a dramatic silhouette against a cloudy sky

Ed Baxter



55 mm Portraits taken with a standard lens can accentuate noses and chins. Medium telephotos give better results



85 mm The facial perspective given by this focal length is much more natural. This is an ideal lens for portraits



200 mm It is possible to make good portraits with this focal length, but sometimes facial features look too flat

from close to, for example, has a steep perspective so that the near end appears much larger than the far end. At a distance, however, perspective is much flatter so that the near end of the wall only seems a little higher than the far end. What the telephoto does is close in on the subject giving the same framing as a nearby viewpoint with a standard lens but the same perspective as a distant viewpoint. Perspective is not actually changed by the telephoto but perspective in photographs taken on a telephoto appears to be unnaturally flat.

This foreshortening effect is something to be wary of, when using a telephoto. It can make photographs look very crowded. In a photograph taken looking down a row of buildings, they seem to be crowded close together.

This can be a useful creative device, but unless you want this particular effect it can be a nuisance. If you are photographing a person at some distance, for example, the background may seem to loom unpleasantly close whether it is in focus or not. Backgrounds that you thought were too far behind your subject to matter may be brought unpleasantly close by telephoto.

Nevertheless, the telephoto's ability to foreshorten may be a positive advantage in certain situations. It is this feature more than anything that makes the medium telephoto so popular for portrait photography.

With a standard or wide angle lens, moving in close enough to the subject to fill the frame with head and shoulders can produce some unpleasant perspective effects. Any parts of the face very close to the lens appear unnaturally large—many sitters have been given huge bulbous noses by close-up shots with a standard lens. With a medium telephoto, you stand much further back from the subject and the less extreme

perspective gives a more natural look. If you wish to produce a flattering portrait of someone with unusually large features, a telephoto may be a simple and unobtrusive way of toning down the large features.

By allowing the photographer to stand back from his subject the medium telephoto also helps to make a portrait session less awkward. With a standard lens, the photographer has to move in intimidatingly close.

A lens of around 90 mm is perhaps the best lens for portraits. Lenses of this size have maximum apertures only slightly smaller than a standard lens and are light and compact. Lens sizes of 100 and 105 mm are also popular for portraits although the perspective is perhaps a little flat and the lenses usually have a slightly smaller maximum aperture. With anything much longer than 135 mm, however, the effect on perspective is sometimes excessive and facial features may look compressed.



Sergio Dorantes

Old soldier An expressive detail picked out by a 135 mm lens can make as strong a picture as a full length shot

If you do use a telephoto for portraits, you will appreciate that they give shallower depth of field than a standard lens, and you should focus on the nearer eye for three-quarters portraits (see page 86).

The shallow depth of field can be both an advantage and a disadvantage. Telephotos appear to be easier to focus than standard lenses if you have an SLR. Because the depth of field is normally visibly less at any given aperture, the subject is either positively in focus or positively out of focus on the camera's focusing screen.

Shallow depth of field can also make it easier to deliberately throw a distracting background out of focus. Using a medium telephoto, you can often blur the background for a portrait without even opening up to maximum aperture.

In low light conditions or when you have a slow film in the camera, however, the depth of field available with even a medium telephoto can be too small. You may find it impossible to get all the subject in focus. In this case you must choose carefully what to focus on.

One way of increasing the depth of field is to use a narrow aperture in combination with a slow shutter. But slow shutter speeds should not usually be used with a medium telephoto unless you have some means of steadying the camera. Because the image with a telephoto is that much larger, any movement of the camera while the shutter is open is exaggerated and may show up in the photograph. The extra weight of a larger lens also makes it harder to hold the camera steady. With a medium telephoto lens, you should not use the camera hand-held with shutter speeds longer than 1/125 second. Lenses with a focal length of 135 mm or longer really need a shutter speed of at least 1/250 second.

Girl on a bicycle A potentially distracting background is subdued by the shallow depth of field of a 200 mm lens



Unfortunately, although maximum apertures are greater than with a long telephoto, the maximum aperture on a medium telephoto is usually less than a standard lens, and on the cheaper versions the loss can be three or four stops even at 135 mm; on a 200 mm lens it may be even more. So, under conditions which would require an exposure of 1/1000 second at $f/1.4$ on the standard lens, a 200 mm lens would need a relatively slow shutter speed for correct exposure. With an $f/4$ lens this would be 1/125 second, which is really too slow for a hand-held shot. It is, therefore, well worth finding some means of keeping the camera steady if you are using a medium telephoto (see page 154).

A tripod is definitely the best means of holding the camera firmly and many



Sergio Dorantes

Window with ivy *Soft lighting heightens the calm atmosphere of this composition created with a 105 mm lens*



medium telephotos have built-in tripod adaptors, but a tripod may be awkward to handle and to carry around—though you may be able to manage with a monopod or some improvised types of camera support. In fact many sports photographers prefer a monopod because it allows them to follow the action that much more easily. Perhaps the best compromise is to use a tripod in the studio, and to use a monopod, or improvise, when on location in poor light conditions.

Whether you are shooting from a tripod or the hand, however, you must allow a greater margin of error in framing with a telephoto than you would with your standard lens. This is again because the narrow angle of view means that framing errors are exaggerated.

One further, but often forgotten, problem that you may encounter when using longer medium telephotos is atmospheric interference. Because the image is that much larger, mist or particles of dust that you hardly notice with the naked eye may become obtrusive in a photograph shot through a medium telephoto. In fact many long distance shots are vague and misty with poor contrast. The loss of definition can often be severe, and on misty days, it is rarely worth using a 200 mm lens for long shots. In addition, on hot days the shimmering of the atmosphere over even a moderate distance can produce unsharp results, particularly when using focal lengths approaching 200 mm. Rippling which you do not notice in the viewfinder can blur the image.

Nevertheless, providing you frame up and focus carefully and keep the camera steady, a medium telephoto can be a useful lens in a wide variety of circumstances.

Lake scene *By closing in on a part of the scene, a long medium telephoto can give a greater sense of place, involving the spectator*

Julian Calder



World of photography

Picture desk

Photography is a vital element of daily newspapers—powerful, interesting pictures graphically reinforce the printed word—and it is the picture desk's responsibility to supply the right picture on time

To the casual visitor, a newspaper office is a centre of noise and chaos. There is a constant barrage of sound as reporters type out their stories, telephones ring, and radios throughout the office are tuned in to the latest news bulletins. At the same time people are continuously crossing the room and every desk seems to be the focus of some major crisis. The picture desk is no exception.

In spite of the apparent chaos, however, the picture desk must be highly organized and efficient. It has to be, for if a photograph is needed for the next day's edition and it is not available in time—it might just as well not exist. In order to supply their newspaper's demands, the picture unit—picture editor, assistants, photographers, researchers, secretaries and the dark-room 'boys'—must work very closely together as a team.

Every day the picture editor has to make sure that there is photographic coverage not only of the major news stories of the day but also of the general

features that will appear in the paper. In order to do this the picture desk keeps in close touch with all the other departments of the newspaper—primarily the news desk, but also the editors responsible for fashion, features, business, art, politics, crime and sport.

The picture desk itself will generally be situated next to the news desk so that the picture editor can remain in constant touch with the news editor. The picture desk will also have its own library of stock pictures, a darkroom, and a wire-room housing the teleprinters that transmit news and pictures from the major news agencies and the newspaper's own photographers.

The picture editor has to deal with a constant traffic of visitors. Staff photographers bring film in to be developed, freelance photographers come in with ideas for news or feature stories or with

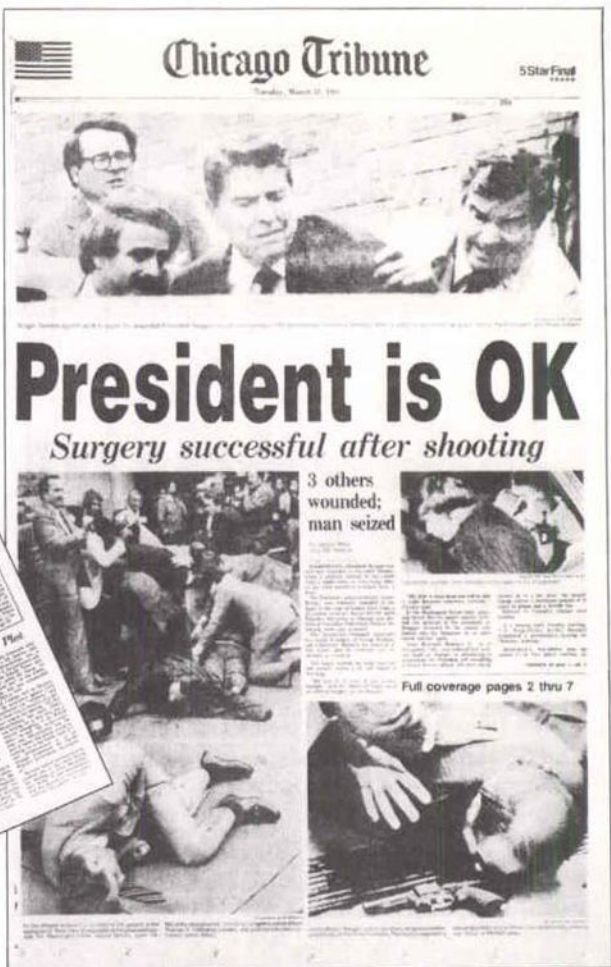
pictures to sell, and agency representatives bring agency pictures in. There may also be camera salesmen selling the latest in photographic hardware, and darkroom assistants scurrying back and forth with sets of contact prints to be scrutinized.

The main task of the picture editor is to obtain good quality pictures by the deadline. Pictures will come from a variety of sources: besides the staff and freelance photographers, the most important and consistent of these are the press agencies—such as the Press Association in Britain; United Press International (UPI), Keystone and Associated Press (AP) in the United States; Agence France Presse (AFP) in France; and Deutsche Presse Archive (dpa) in Germany. These agencies issue news to all the national and provincial newspapers in their home countries by wire service and do the same for newspapers abroad if the stories are of international interest. In addition they may also provide pictures especially for the national press.

Streaker at Twickenham *Ian Bradshaw of the Sunday Mirror captured this scene with a 200 mm lens. Used large, it made a striking front page picture*



Syndication International



The front page A selection of newspapers issued the day after the assassination attempt on President Reagan, showing the use made of the pictures distributed by AP and UPI. The AP pictures were distributed in the United States by 'laserphoto'—a high technology method which uses a laser scan to transmit pictures much more rapidly than the traditional wirephoto. All the papers feature Ron Edmonds' shots of the President being hustled into his limousine. Here photographers and newsmen were present at a minor 'planned' event which suddenly became 'hard' news

Provincial newspapers often rely almost totally on this service for everything but local news, but national newspapers prefer to generate their own news and pictures. They are in competition with other national newspapers and must therefore aim to produce photographs that will stimulate their particular readers to buy and keep on buying their newspapers.

No picture desk is better than its sources of information, so one of the main tasks of the people on the picture desk is to search the agency tapes for news stories worth illustrating. These tapes run all day and provide information on anything from the latest stock market reports to items of 'hot' news. The other most important source of news is the radio, and the picture staff will constantly retune the radio in order to catch every scrap of news.

Other newspapers are also scoured



Paul Popper Ltd/UPI

for nuggets of news, perhaps missed the day before but still good enough to follow up for a later feature or to provide a new idea for the day. The telephone is an additional source of news, and one of several on the picture desk is always ringing. These calls are always answered promptly. This time it may not be another freelance photographer looking for work but a reporter or an agency with an important item of news.

Once an interesting story is found, the picture editor has to decide whether the story will provide a good illustration for the kind of newspaper he is working on, and act quickly if the pictures are to make the next day's edition.

There are three distinct types of photography in a daily newspaper. First, there is the 'hard' or unexpected news which has to be covered immediately. Then there is the so-called 'planned' news which includes public events and sport. Here photographic assignments often have to be arranged well in advance. Thirdly, there are the features—such as fashion, portraits and publicity—for which photographic assignments are usually decided by individual editors and commissioned in association with the picture department.

Tracking down a 'hard' news story is generally a matter of combining ingenuity, good timing and luck. Both the picture editor and the photographers listen to early news bulletins in the morning before they go into the office so that they can catch up with important

news items that have occurred over night. The famous American news photographer, Weegee (Arthur Fellig), used to sleep fully dressed with a police radio next to his ear so that he wouldn't miss any of the hard news stories. He reckoned that he could sleep through reports of minor incidents but be awake and away at the first hint of a fire, a break-in or a murder.

Today's newspaper photographers rarely have to go to such lengths or work such hours. They must be ready to follow up any story that the picture editor thinks is worth illustrating, however, and may have to stay on that particular assignment as long as it takes to get the right pictures. When a story comes up, the editor locates the nearest photographer to the scene and makes sure that he knows where the nearest wire machine available for use is located.

The spectacular news photograph is often a matter of luck. Melville Parry, an eighteen year old trainee photographer from the Merthyr Express, took one of the most dramatic photographs of the Aberfan disaster in South Wales because he happened to hear a rumour of it on his way to work one day and went straight to the scene of the disaster. By being there early he was able to capture the true drama of the event and his main picture won the News Picture of the World Award in the United Kingdom and was used in many major newspapers.

However ingenious or well-informed

The assassin's knife Yasushi Nagao took this dramatic picture moments after a Japanese socialist leader had been stabbed by a right-wing assailant

the photographer is, pictures from a 'rush' assignment are never predictable. Wasted time and effort are inevitable and the picture desk has to learn to take disappointment as a matter of course. They know that they can never pin all their hopes on a particular assignment and there is always an alternative prepared. Many daily newspapers work to such a small budget that they cannot afford to send large numbers of photographers all over the country chasing every news incident.

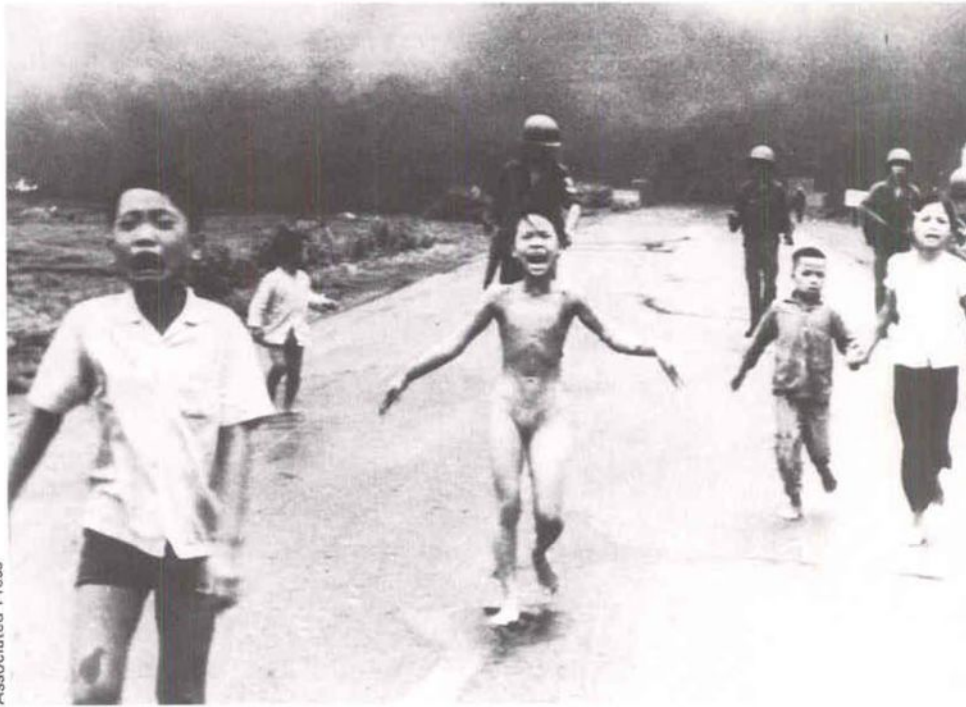
A fire in a local factory, for example, may sound dramatic on the radio or telephone but if it is put out within a matter of hours it will only merit a few lines in a provincial newspaper. However, if people are killed or trapped inside the building, the story may prove to be of national interest. In a case like this a local 'stringer' may be asked to cover the story for a national newspaper or the newspaper may even send an additional staff reporter and photographer to the scene. If, later, signs of arson or faulty safety systems are discovered the newspaper may feel that the story is worth covering in greater detail or even as a feature story.

A news diary is kept of public events and sports fixtures so that arrangements for photography can be made well in

advance. The photographers are commissioned in advance and hotels and flights have to be booked. Different organizations may also have to be consulted about special arrangements for the press or the issue of press passes.

On a large state occasion, for example, security may dictate that only a small number of photographers can be allowed to attend. Passes may only be issued to a few photographers who may, in turn, represent the national newspapers, the provincial newspapers and the news agencies. If this happens, the newspapers have to be content with the choice from a single set of contact prints, which are also sent to their rivals.

Vietnam Two single shots that captured the horror and futility of the Vietnam war and which appeared in newspapers all over the world, thus adding fuel to the anti-war campaign. The children were photographed by Nguyen Kong (Nick) Ut after a misplaced US napalm strike, and Eddie Adams took the picture of a Vietcong officer's street execution by a South Vietnamese general



Associated Press



Associated Press

There are ways in which the newspapers can expand their coverage of such events with a little imagination. At the state funeral of Sir Winston Churchill, the picture editors of the London *Sunday Times* had to stretch their resources to the utmost. It was an occasion of great national significance and they had to cover it in black and white for the next day's edition and also in colour for use in a later edition of the paper's colour magazine. In the end they commissioned 21 photographers to cover the funeral.

In this way, a huge variety of subjects and angles was achieved and the

pictures assured a spectacular issue the next day and a memorable record of the event. The picture editors had worked long and hard to examine the area where the event was to take place for interesting camera positions. They had directed the most appropriate photographers to each location. The final number of images chosen may have been few, but they were all successful.

This kind of blanket coverage can only be used in exceptional circumstances. Generally the picture editor has to work within a fairly restricted budget and with more limited means at his disposal.

Above all, he has to work to a deadline. If this is a daily deadline then the daily routine of the newspaper office will be structured around the day's main editorial meeting. Wherever possible, all the photographs have to be ready for this initial deadline—generally at about four o'clock in the afternoon. During this meeting, the main news story for the following day is decided upon. The editors then consider possible photographs and agree the layout of the front page.

Once a particular news photograph is selected, the task of captioning and scaling the photographs to size can be started. Depending on the layout, the photographs will be edited for size, shape and story content. There is just not time on a daily newspaper to pore over thousands of contact prints, blow-ups and different crops before making final decisions. In most newspapers the photographs will appear in a size and shape corresponding to the photographer's print, but the final decision about this will often lie with the night editor who occasionally surprises the picture desk the next morning with a new layout. As Keith Smith, picture editor of *The Times*, says, 'You can never get above your station in a newspaper. There is always someone upstairs to kick you around'.

In spite of this, it is the picture editor who ultimately determines the quality of the bulk of the pictures that appear in the pages of the daily newspaper. It is also the picture editor who is responsible for the day to day organization, administration and co-ordination. He must have sound news judgement, wide interests, a practical nature and a strong sense of his own paper's requirements. He must, above all, have a good eye for a picture.

Photographs may have many individual

Cropping Used in the Sunday Times to illustrate a feature on the 1976 Notting Hill Carnival riot and cropped to the area shown by the dotted lines to give the picture more impact on the printed page. But it also implies that the boy is gesturing at the policeman instead of at something behind his head

Hold-up Spanish minister held at gunpoint during the attempted military coup in February 1981. A dramatic news picture resulting from a combination of luck and skill

Homer Sykes.



Associated Press/Manuel Barriopedro

qualities, but newspaper pictures which are intended to illustrate news stories must fulfil certain specific needs. Harold Evans, the editor of *The Times* and author of the book *Pictures on a Page*, has had many years experience of selecting pictures to appear in both provincial and national newspapers and has stated that publishable photographs should have one or more of three values. The three are: animation, relevant context and depth of meaning.

As the initial controller of pictures, the picture editor carries a great deal of responsibility. He not only decides what is to be photographed but he can also select, suppress and distort pictures if he chooses. He may often be faced with a very strong moral dilemma over a decision to publish a certain type of

picture and although his decision is usually followed, the final say as to what appears in the paper is the editor's.

Sometimes a picture may be rejected even though it fulfils all the usual requirements of a good newspaper picture. For example, in 1963 Malcolm Browne photographed a Buddhist monk setting himself on fire as a protest against the atrocities committed in Vietnam. Although the picture editor of *The New York Times*, John Morris, wanted to use the photograph, the paper's editors rejected it, on the grounds that it was 'unfit for the breakfast table'.

Where photographs might be offensive or where they portray extreme violence, the editor must consider whether the event it portrays is of such

social or historical significance that the horror is justified. But these are rare cases—usually the picture editor simply tries to exercise good taste and a sympathy towards the human predicament, and endeavours to avoid legal and social pitfalls.

It is the photographer himself who has perhaps the most difficult and demanding job in the picture department. However well he is backed up by the picture desk, he is the one who has to deal with the hard realities of the job. He needs stamina, patience and tenacity. He must follow instructions, be in the right place at the right time, work fast, and achieve in one dramatic shot a picture that the next morning will tell all, and be remembered long after a fleeting television film of the same event.

Finally, after all his work, he must learn not to complain when the photograph is either not used at all or cropped out of all recognition. He knows how newspapers work, and that very often a photograph, however good, must be cropped for reasons of space, or to give a particular emphasis to a story.

The picture editor will also often be responsible for providing captions for the pictures used in his newspaper—another task which is subject to pitfalls. A caption can give a completely misleading meaning to a photograph.

Working to tight deadlines and tight budgets, the picture editor is constantly under pressure. He, or she, will be juggling with resources, and having to make continual decisions as to which events are most likely to provide the newspaper with 'scoop' pictures. Whether he succeeds or fails can be judged the next day when the newspaper appears. The picture editor's choice and judgement will also inevitably affect the newspaper's circulation and standing with the public.

Basic darkroom equipment

There is more to setting up a darkroom than just blacking out the windows and buying an enlarger. Carefully chosen equipment can save time, and make processing and printing a great deal easier



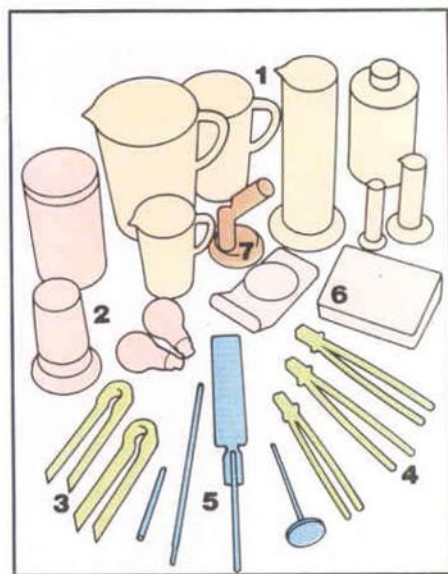
Setting up a home darkroom requires a large range of equipment besides printing paper and chemicals. Most of it is fairly cheap and simple, and it is easy to buy the first things you see in the shop. But for even the most basic items there are alternatives, and making the right choice makes life in the darkroom much easier and can make the difference between consistently good and variable results from your negatives.

Some manufacturers market 'complete' darkroom kits and many of these are good value for money. Not all of them, however, offer all the equipment or quality you require, and a few offer too much. To evaluate each kit and decide which is best for you, it is essential to know a little about each individual item. Indeed, you may find that the only way to obtain the exact range of equipment you want is to purchase each item separately.

Essential darkroom equipment falls into three main areas: film processing equipment, print processing equipment, and equipment for monitoring time or temperature and for measuring and storing the chemicals for both processes.

Processing film

Rather than plunge in at the deep end with enlarging and printing, many photographers start off in the darkroom by processing film only. To save expense, some photographers process film with a bare minimum of purpose-made equipment and improvise the rest from things around the house. Quality often suffers from this casual approach, however, and it is better to buy the proper equipment. The most important piece of equipment, the developing tank, cannot be improvised.



Darkroom essentials Key to photograph

- 1 Measuring cylinders
- 2 Safelights and safe bulbs
- 3 and 4 Print tongs, plastic and bamboo
- 5 Thermometers
- 6 Timers, with seconds bleeper at left
- 7 Focusing magnifier

Victor Watts

Developing tanks Although an important and often expensive piece of equipment, the developing tank is simply a container to hold the film and chemicals during processing. Unfortunately, the perfect developing tank has yet to be invented. It must, obviously, be completely light-tight to allow development in normal room light. It must also be water-tight, except when you want to change chemicals during processing and then it must be possible to empty and fill it very quickly.

Tanks are usually made of black plastic or stainless steel. Stainless steel tanks conduct heat well and are easier to warm up in a water bath. But they also lose heat very rapidly as soon as you remove them from the bath. A plastic tank, though harder to heat up, retains heat for longer. Since with fast modern processing times many photographers dispense with a water bath and rely on prewarmed chemicals retaining sufficient heat during processing, the extra insulation of a plastic tank might be an advantage.

Stainless steel tanks are unbreakable, but they may bend when dropped heavily so that the lid will not fit properly. Plastic tanks, on the other hand, are very robust, but can be cracked if mistreated. They are also very sensitive to heat and some crack even if washed in hot water. On the other hand, you can even dry out a stainless steel tank in the oven if you wish to re-use it in a hurry.

When starting out, most people buy a tank that has a single film spiral, but if you frequently have many films to develop, you may find a *multi roll* tank more useful. Multi roll tanks will take three or more spirals and allow you to develop a number of films together.

Plastic tanks usually have nylon spirals; metal tanks have metal spirals, although they are sometimes interchangeable. Neither has any marked advantages over the other. Some people find it easier to load metal spiral; others find it easier to load a plastic spiral. The best way to decide which suits you best is to take a fogged film with you when choosing a tank, and try out a number of spirals. The methods of loading each type are shown on pages 43 and 44.

An important feature of plastic tanks is that they generally fill and empty very quickly. This is an advantage when it comes to timing processes—many stainless steel tanks take 15 to 20 seconds to drain and fill, and when judging development times you must remember this. The most recent colour processes use very short development times, and drain and fill times might well account for 20 per cent of the whole development time if you are using a steel tank.

Since it is impractical to check the leakproof qualities of different tanks in the shop where you buy—some tanks dribble large quantities of solution when inverted—we ran a test ourselves. Fill and drain times were also tested, as was the minimum quantity of solution needed to develop one roll of 35 mm film. Tank

brands are named, but the tanks may be sold under different names by different suppliers (see page 492).

Washing film When a film has been processed it has to be washed and dried. Although it is possible to wash a newly developed film in an open tank under a stream of running water, specially designed film washers do the job more efficiently and more quickly.

The simplest kind of washer is a short length of rubber or plastic tubing that takes water from the tap to the inside of the developing tank. This forces water to flow under pressure from the bottom of the tank upwards, past the film and out through the top of the tank. Manufacturers of some of the more expensive types claim that their washers will wash films in as little as five minutes.

Some washers use water pressure from the tap to spin the spiral holding the film round and round. Another, called a *turbo-washer* mixes air with the water and so sends bubbles as well as water through the developing tank. This is supposed to speed up the washing process still further.

Drying film Film dries much more quickly if surplus water is removed before hanging. You can do this lightly with your fingers, with a piece of chamois leather, a sponge, or a pair of specially designed film wipers. Whatever you use, it must be kept scrupulously clean, because dirt can make tram line scratches down the film.

The blades of most film wipers, which look like car windscreen wiper blades, are often heavy and stiff. If you decide to buy a pair, look for the kind with very lightweight flimsy blades. Despite their fragile appearance, they work well, and are less likely to scratch the film.

You can use clothes pegs to hang up the film, but they tend to leave drying marks and dirt. It is worth spending a little extra to buy a pair of film clips. One type is weighted to prevent the film from curling, and most clips hold the film in such a way that no water is retained. This more or less eliminates streaks and marks in drying.

Print processing

After leaving developing tanks, poorly made masking frames are probably the greatest source of irritation in the darkroom. To work well, a masking frame must hold the paper perfectly flat, and in exactly the right position. Many cheap masking frames fail to do either of these things, and the result is unsharp prints with crooked borders.

The basis of a masking frame is simple. It is a flat wood or metal board with a hinged framework that lifts up for the insertion of printing paper. It has adjustable arms to accommodate different paper sizes and to vary the width of border. When lowered, the framework

holds the paper flat and it should be impossible to slide the paper around underneath it. A masking frame that does not hold the paper firmly flat is not worth having.

The more you pay for a masking frame, the more solidly it is likely to be built. The large sized, heavy duty models can cost as much as an enlarger. Cheaper frames have non-adjustable border widths, and only take small sizes of paper. However, if you rarely make very large prints, and trim off borders after printing, a cheap frame should be adequate.

Besides the basic frame, there are several special types on the market. The most common are designed for making borderless prints. Professional printers use a *vacuum easel* for this purpose—a pierced board attached to a suction pump, which sucks the paper down flat. Unfortunately, these are very expensive. Manufacturers have adopted a number of cheaper systems, as a result, though some of these may prove to be less than satisfactory.

One type uses a *low tack* adhesive which is supposed to hold the paper flat. This is not very satisfactory, as the adhesive layer collects dust and has to be renewed periodically. A second system holds the paper flat under glass, but this collects dust which shows up on the print. A third alternative holds the paper by the corners, but this often fails to keep the paper flat. The best solution is probably to print with white borders, then trim them off.

Focusing devices It is not always easy to focus the enlarger, particularly when a dense negative is in the carrier. Focusing magnifiers make this task easier. They stand on the masking



Victor Watts

Thermometer choice A simple spirit thermometer is cheap and is more accurate than floating or dial types. Electronic models are very precise



Tank test We tried out six different tanks, testing them for filling and draining times, and checking the minimum volume of solution needed to cover a 35 mm film. No tank was leakproof, but some were more watertight than others

Dixons stainless

Fill time—7 secs
Drain time—8 secs
Min vol—293 ml
Solidly made 'own brand' tank for 120 and 35 mm, but leaked badly

Jobo daylight tank

Fill time—12 secs
Drain time—6 secs
Min vol—393 ml
This tank needed no darkroom for loading film, but filled very slowly indeed, leaked a lot during processing and used more chemicals than any other tank

Kaiser

Fill time—5 secs
Drain time—5 secs
Min vol—323 ml
Neat looking tank that was reasonably watertight and filled and emptied quite quickly

Paterson Universal

Fill time—5 secs
Drain time—4 secs
Min vol—290 ml
Very popular brand of tank with wide mouth, making pouring easy and quick. It leaked a lot of solution when we tested it

Durst

Fill time—8 secs
Drain time—5 secs
Min vol—267 ml
Almost watertight tank—it only leaked one drop. It also used the absolute minimum volume of solution

Ilford 72 tank

Fill time—8 secs
Drain time—6 secs
Min vol—353 ml
This was a special tank for Ilford's 72 exposure film. It leaked badly, but frame for frame it used less solution than any other tank

frame, and consist of a small mirror, which reflects the image of the negative up to an eyepiece—actually a simple microscope. The eyepiece is adjustable to suit the eyesight of the user, and when the enlarger image is correctly adjusted, a clear picture of the grain of the negative snaps into focus in the eyepiece.

A second type of focusing aid is simply a mirror which reflects the image of the negative onto a ground glass screen where it is easier to see than on the paper itself. These devices are not as precise as enlarging magnifiers.

The wet bench Developing trays are one type of darkroom equipment where it is possible to make economies without adversely affecting picture quality. Many photographers successfully improvise trays from greenhouse seed trays, cat litter trays or window troughs.

Proper darkroom trays do have a number of points in their favour, however. They are rigid, making spillage less likely when they are full of chemicals, and they have spouts for pouring solutions. The better ones have small indentations in the bottom and sides to hold a thermometer in place.

Purpose built troughs come in several

colours—usually red, grey and white—and most photographers buy three colours and use the same solution in each one every time they are used. Clear plastic trays are also available, and these are useful when processing certain types of sheet film—you can shine a red light through them to see how development is progressing.

Print tongs are a good idea, even for a beginner, because they avoid chemicals coming into contact with your skin and stop cross contamination of the processing solutions. Two pairs are needed: one for the developer, and one pair shared between stop and fix.

Whatever kind of tongs you use, they must have a firm enough grip to hold large slippery sheets of paper, and yet not scratch the surface of the paper. Plastic tongs range from poor to reasonably good, but even the best of them break very easily. The most resilient tongs are rubber tipped, and made from stainless steel or bamboo strips. Bamboo tongs stain quite quickly, but they are colour coded like trays, and the staining does not seem to do any practical damage to processing solutions.

Safelights Black and white printing

paper is sensitive only to blue light, and can be handled quite safely by dim yellow or red light. Consequently, darkroom lights are usually of these colours.

In their simplest form, they consist of ordinary light bulbs dipped in a special red dye—ordinary decorative red light bulbs must not be used. They have a rubber ring where the glass meets the metal cap to stop light leaks. These bulbs are much cheaper than even the least expensive safelight, and are perfectly adequate for most purposes.

There are many other designs for safelights and most of them are quite satisfactory. The only point to look for is the light seal. A safelight that leaks white light will ruin your prints. Some safelights have interchangeable coloured filters, but if you buy a red safelight, this should be unnecessary because it can be used both with paper and orthochromatic film. A yellow light can be used only with paper.

Measuring equipment

For good results in the darkroom, both film and print processes must be measured accurately. Solutions must be made up to the right concentration,

processes must take place at the right temperature and development must be timed accurately.

Measuring Cylinders To mix up solutions in the correct proportions and to ensure that exactly the right amount of solution is used in the process, you must have some way of measuring liquids. Some photographers improvise with cheap kitchen measuring jugs but these are not sufficiently accurate—many films have been ruined by such crude methods. Indeed, using kitchen containers for mixing chemicals is to be positively discouraged since someone may accidentally use a contaminated container for food.

Proper measuring cylinders are generally made either of semi-opaque polypropylene or transparent polystyrene. The semi-opaque cylinders are almost unbreakable but stain easily and their markings become difficult to read.

Clear plastic measuring cylinders are cheap and fairly durable. But you should check that the graduations are moulded into the plastic and not just printed on the outside, as these may be scratched off or fade. Some clear plastic beakers are not resistant to the concentrated acetic acid found in some stop baths. The acid etches the inside of the cylinder, making the graduations difficult to read. As a result, it is worth buying a small cylinder purely for stop bath concentrate.

Although it is possible to measure any quantity of liquid in a large cylinder, small quantities cannot be measured accurately and it is necessary to buy a range of sizes. A very small cylinder is particularly important if you use concentrated negative developers like Kodak HC-110 or Paterson Acutol. A good choice is 1000 ml, 250 ml, and 50 ml flasks.

Measuring temperature Accurate temperature measurement is important because the temperature of almost all the solutions used affects the rate at which the chemical processes take place. If the developer is too warm, film will be overdeveloped even if the processing time is correct.

The cheapest thermometers are filled with a thread of alcohol, often coloured blue so that it can be clearly seen under the safelight. Although a cheap thermometer is better than none at all, it is worth spending a little extra for something more accurate. Most spirit thermometers are accurate to within about half a degree Centigrade, which is quite adequate for black and white work, though not for colour.

Greater precision is obtainable from mercury thermometers, though these are generally expensive. They are often accurate to within 0.2°C. Since thermometers are easily broken, some

photographers keep a mercury thermometer safely locked away to provide a check, and use cheap spirit thermometers for their darkroom work.

There are several other types of thermometers apart from the traditional straight glass variety. Some are crooked, so that they do not roll around in the bottom of a dish, and some thermometers float—this can be useful when you are mixing large quantities of chemicals. Dial thermometers have a clock-like dial about 5 cm in diameter attached to a long metal stem. Although they are very easy to read, dial thermometers are not usually as accurate as straight mercury thermometers, and are often expensive.

Electronic thermometers have been used for many years in processing laboratories. These are ideal for a club or for a semi-professional photographer because they have a large digital display which indicates the temperature with great precision. Unfortunately, they are very expensive compared to ordinary mercury thermometers.

When buying a thermometer, do not forget to check the range of temperatures that it covers, particularly if you anticipate developing colour films, which frequently need to be processed at temperatures in excess of 41°C. Even some black and white developers have to be mixed from crystals at similar temperatures.

Measuring time Although a clock with a sweep second hand is adequate to begin with, it is not sufficiently accurate for times shorter than about 12 or 15 seconds. When printing pictures, it is a great help to have one of the many

electronic timers that are on the market, and if you are printing a number of identical copies from one negative, a timer is essential.

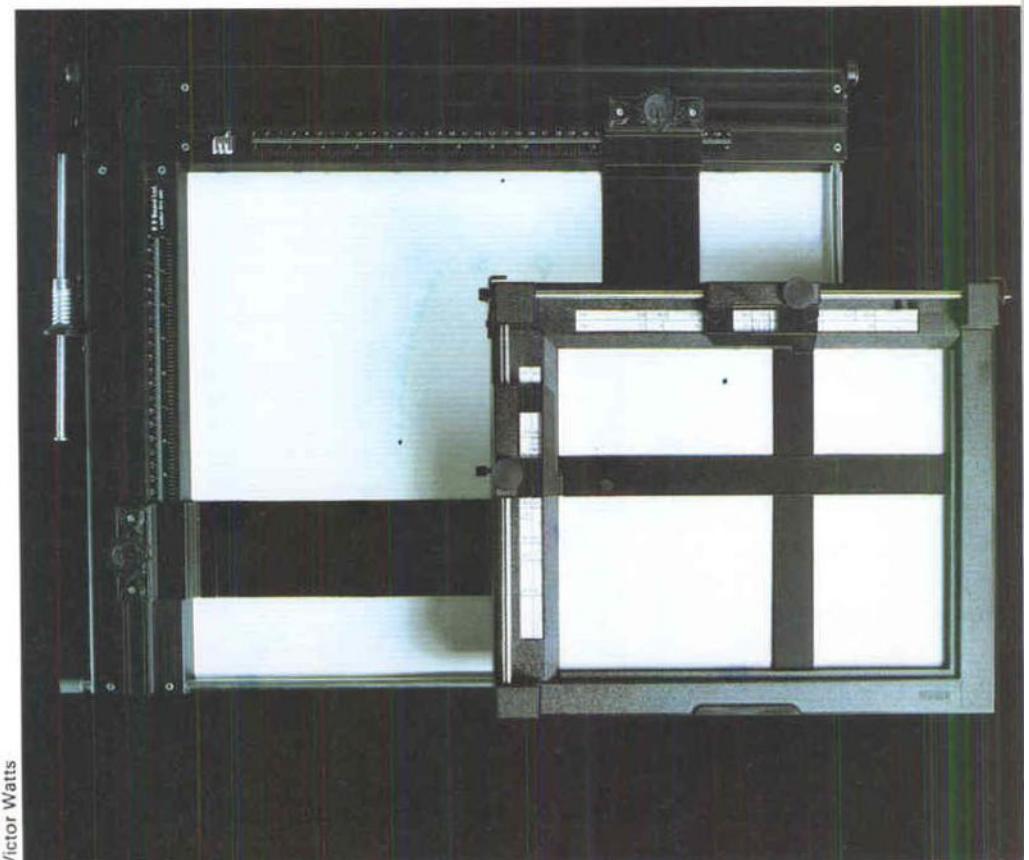
Most timers can be preset to the required exposure time, and when a button is pressed, the enlarger light is switched on for the required period. The most modern type, which has a digital readout of the time that has elapsed since the enlarger was switched on is particularly useful, as it makes dodging of a print much easier—you know when to start and stop without having to look at a separate clock.

Basic timers only switch the enlarger on and off, but the more sophisticated models also do other things. Some turn the darkroom safelights out while the enlarger light is on. This makes it easier to see the image on the baseboard and shading the picture is made simpler. A very useful point to look for is a footswitch—turning the enlarger on with your foot leaves you with both hands free.

Try to avoid the type of timer that has two ranges, such as one to nine seconds and 10 to 90 seconds. It is easy to forget to change the range and this can waste a lot of paper and time. Timers that have one continuous range eliminate this simple mistake.

A lot of photographers do not use a timer at all, but time prints using a metronome or a flashing light. Although these are not suitable for short exposures they are sufficiently accurate for exposures exceeding 12 seconds. And they are also comparatively cheap.

So, make your choice!



Victor Watts

Masking frames Large masking frames are very costly so, if you rarely make big prints, a smaller model should be quite adequate. Look for solid construction, adjustable borders, and the ability to hold the paper perfectly flat

Professional v. Amateur

How different are professional and amateur approaches to photography? The Photo set the same assignment to an enthusiast and an expert to find out

We asked both an amateur and a professional photographer to go to St. Katherine's Yacht Haven to produce a selection of shots representative of their approaches to the subject. The only brief given was that each should try to capture the atmosphere of the place.

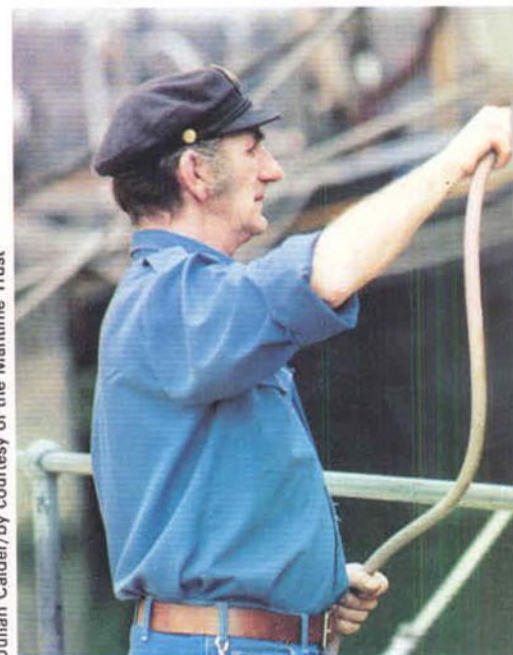
Established professional, Julian Calder, and relatively inexperienced amateur, Anton Franks, both had to test their skills in making the most of a dull after-

noon. They were asked to limit their equipment to a camera body, a 24 mm wide angle and an 80-200 mm zoom, but were allowed to take whatever accessories they chose. It is interesting to note that only the professional used extra items—filters and a tripod. He also took along a reliable hand-held light meter to cope with any awkward lighting.

The two approaches were obviously different, with Julian working system-



Anton Franks



Julian Calder/by courtesy of the Maritime Trust

High viewpoint Julian established the setting by obtaining permission to use a nearby building. He did not try to include the whole area but composed the shot to include the most interesting view

Chains The amateur's attention was drawn to this pile of chain and this could have produced a good shot. Unfortunately, it was spoilt by the flat lighting and shallow depth of field

Hosing down One of the most obvious differences between the approaches is that people featured in many of the professional shots. Here Julian used the zoom to capture the man at his work

Red chain Julian also photographed some of the many chains to be found in the area, but for this shot he exploited the red of the boat's paintwork to introduce a bright colour. The dull day was not ideal for this approach



Julian Calder/by courtesy of the Tower Hotel



Red and green vessel Anton wanted a good shot of one of the ships tied up at the dockside. By using the 24 mm lens he introduced obvious distortion to the hull. The choice of lens and viewpoint meant that neither the vessel nor the surrounding area was shown clearly or in an attractive way

In dock Julian also decided to try photographing a moored boat, but his approach to the subject was very different. Using the same 24 mm lens he focused on the bollard and allowed the great depth of field of the lens to keep the ropes in focus as they receded towards the ship. The composition itself is arresting and also uses the textures of the ropes and the deck effectively. The writing on the top of the bollard includes the name of the dock, adding information to help establish the location

Anton Franks



Julian Calder

Julian Calder

Anton Franks



atically towards a coverage that included as many different subjects as possible. To make the most of the scene, he obtained permission to photograph from the top of a nearby building. For other shots he showed no reluctance to take shots of people at close range.

Anton, however, found it harder to isolate subjects from the scene as a whole. Without the professional experience of taking photographs for a client, he concentrated on shots that had a purely personal appeal. Exposure problems spoiled many of his better compositions and his ideas were often not explored sufficiently to yield effective images.

Restaurant Anton
made good use of the zoom for this shot of a converted barge **Lightship**. He also tried to make use of a high viewpoint

Lady Gwynfred
With the colour and lettering design as the main subject, Julian used a tripod for maximum sharpness



Anton Franks



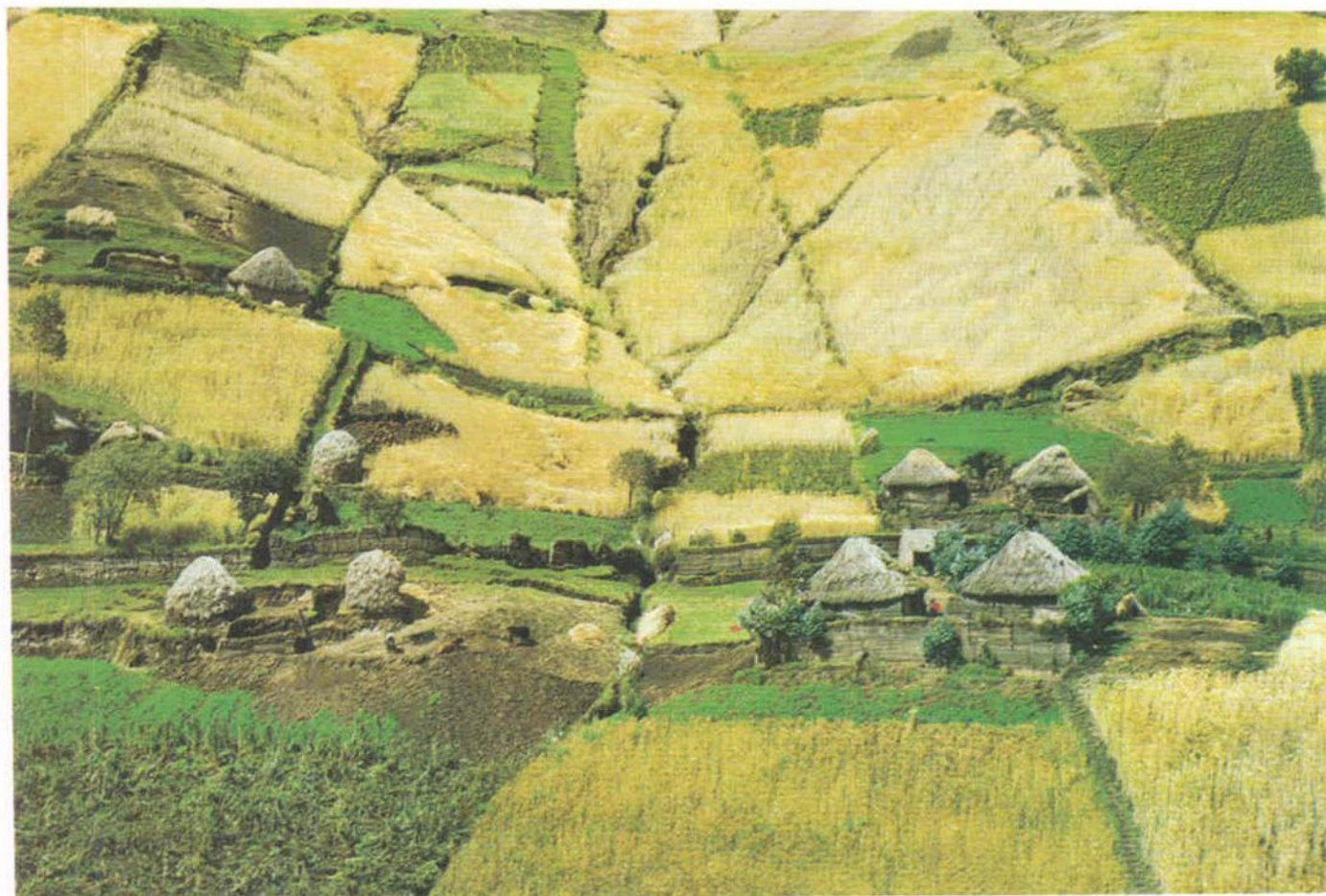
Julian Calder



Creative approach

The rough and the smooth

Alone, or in contrast with others, textures play a vital role in lending an extra dimension to a flat image. But as well as enhancing the impact of a photograph, textures are good subjects in their own right



Vautier/de Nanxe

Textures play a vital role in the appearance of most photographs and, with the right lighting, modern cameras and film can record even the most subtle textural details. They enhance the shapes, patterns, colours or general composition of an image while also providing an abundance of subject matter in their own right.

Our environment includes a multitude of different surfaces. Close observation reveals a wealth of detail and texture. The visible texture of a surface shows how it feels to the touch—whether it is rough, smooth, hard or soft. The camera can record this tactile element and recall the precise nature of a familiar surface—it can give us a vivid visual impression of a sensual experience.

Texture can be used by the photo-

grapher deliberately to enhance a particular shot, giving an impression of solidity, for example. In landscapes, textural details help to separate the different areas of the composition. A field with no textural detail at all would present a large uninteresting area making the picture flat and dull.

Textures within a landscape are best revealed by a directional light such as that produced by late afternoon sunlight. The powerful light of a strong sun exaggerates texture, and this can be very useful if a dramatic image is required.

In urban environments, interesting textures can be found almost everywhere. The granular texture of a street or the alternating smooth and rough of peeling paintwork, for instance, can

Landscape *The shaggy textures of the fields and the thatched cottages give this shot an unusual feel*

provide fascinating subjects in close-up. So too can larger surfaces such as stone, concrete or brick walls, or smooth metal surfaces like gasometers and water tanks.

Even the most unpromising sights may be very rewarding. Most cities and towns, for example, have small areas of wasteland in which discarded household goods and machinery items can be found. Instead of rejecting these objects as rubbish, look for the rich textures of rusting metal and splitting upholstery. Close in on them and use them as pictures in their own right, excluding all but a few minor indications of form.

Alternatively, you can include a certain amount of the background to relate these objects to their immediate environment. This kind of shot is particularly effective with a wide angle lens. Low light and long shadows can be used to increase the effect of depth, and may also serve to heighten the sense of drama the image can create.

Urban landscapes are not the only areas where interesting subject matter can be found. Man-made objects are only part of the textural world that surrounds us. Elements of the natural world—rural hedgerows, rocks, forests—offer an enormous range of different textures. And textures can be combined with differing gradations of tone. A tree, for instance, provides a different tone from that of grass, but it will also provide a totally different textural quality. Taking this as a basis, it is possible to build up a series of abstract tones and textures.

There are also many other abstract possibilities. Ploughed fields, for instance, include the granular texture of broken earth and also draw lines across a composition, which may be used to carry the viewer's eye from one area of interest to another. These lines may



Ed Buziak

Pineapple Fruit and vegetables are very popular subjects for textures. This backlit cross-section is a good example

Corrugated iron The lighting helps the rust and peeling paint on these walls to present an attractive textural image



Michael Newton

give a feeling of depth and distance to a photograph, by extending from one compositional plane, and one area of texture, to the next. Hedgerows, fences and walls can perform the same function, breaking up the scene into distinct abstract shapes, so that the areas created form a smaller tonal and textural complex and build up into an integrated design pattern.

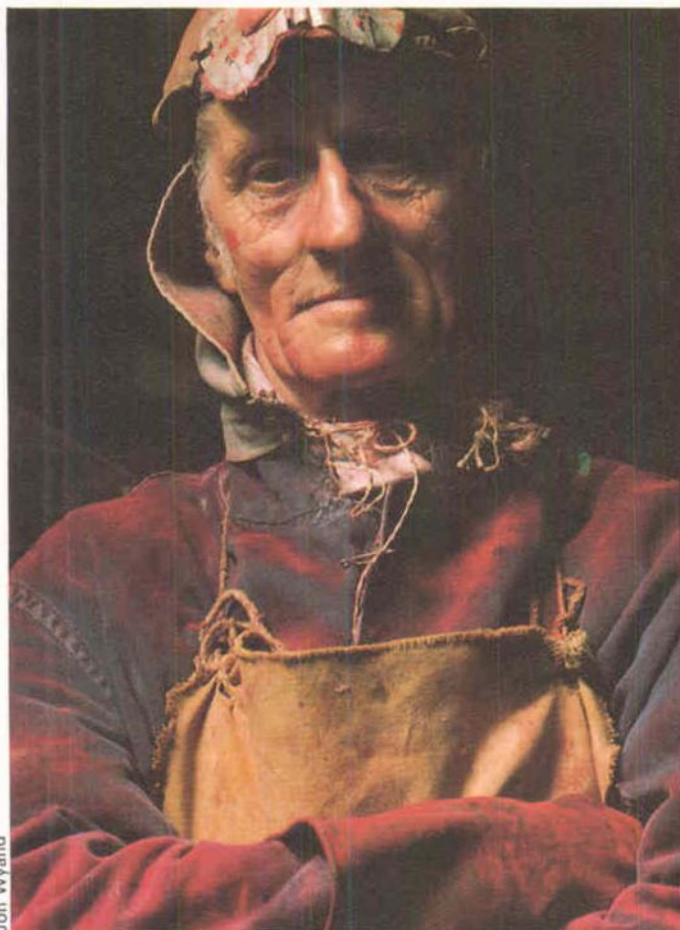
The architectural photographer usually waits until late afternoon when the sun's rays cut across the surface of the building, picking up all the fine detail. Similarly, any subject with a subtle texture but an even range of tones can be given interest if it is lit in such a way that highlights and shadows are created within the indentations of its surface.

The textures found in food can be emphasized and made to look more appetizing by skilful lighting. Compare the texture of the skin of an orange and the juicy fruit inside, the rugged crust of a loaf of bread and the smooth, spongy interior. To exaggerate almost any delicate texture, the light should be strong, directional and angled to pick out the highlights.

In the case of subjects which already have a pronounced texture, such as the bark of a tree, a pebble beach, a field of barley, or a lace tablecloth, even a cabbage cut in half, the light source should be softened considerably to prevent the shadow becoming too large and too dense. Professional photographers often prefer a broad, diffused light which casts almost no shadow at all—such as that created by an overcast day—to convey the textures of these

Feathers The colour and pattern of these feathers are attractive enough but it is the texture that creates the main appeal





Paint factory worker This photograph uses various textures together—different materials, string and the man's skin

more broken surfaces. If strong, direct light is the only source available, some form of diffusing material can be used to soften the light. If the sun is streaming in through a window, for example, a large sheet of tissue paper hung between the window and the subject will soften the path of the light. Tissue paper can

also be used over the front of studio lights, as can translucent perspex, although the quality and type of softening effect achieved will be different. If a flashgun, positioned away from the camera, is used, then an ordinary white handkerchief over the flash head provides an excellent softening device.



Industrial pipes Whether used alone or with a contrasting texture, shiny steel has an eye-catching appearance

Texture is of great importance in the photography of animals and plants. Plants have their own distinctive surface textures. For instance, if you look carefully at a sticky bud and an acorn, both appear smooth, but are totally different in texture. Lighting plays an important part in differentiating the tactile feel of one from that of the other. The use of low, direct lighting from the front best distinguishes between these two different surfaces. The texture of animal fur, in contrast, is often best displayed by the use of backlighting which sets off the subject against its background.

An interesting texture to explore under different lighting conditions is that of human skin. Although the harsh light of the midday sun is not sympathetic to the texture of skin, strong sidelighting can pick out fine details, such as the wrinkles on an old person's face. A degree of underexposure will also show up the texture of skin. On the other hand, in professional portrait and fashion photography, every effort is made to minimize skin texture. Soft frontal lighting, creating a low contrast range, is often combined with a degree of overexposure to produce a more romantic effect.

Ornamental garden This shot uses the textures of the foliage and gravel to enhance the colours and the symmetry



Thatched roof The pronounced texture of this roof contrasts with the smooth curtain and the flatness of the wall

Texture can also be photographed as a subject in its own right, simply by going in very close. Details of plants and vegetables have been a favourite subject for photographers for a long time. Close-up photography is both interesting and exciting, although special equipment is needed, such as bellows or close-up rings which are placed between the lens and the camera body, supplementary lenses or special macro lenses. The lens must be stopped down to its smallest aperture setting when working in close-up, as depth of field is cut to a minimum. Extending the lens forward calls for a re-calculation of the exposure value, since the lens to film plane distance has been increased. A through-the-lens meter will automatically make the compensation, however.

Finally, if texture is to be revealed at its best, it is essential to select a slow film. The ability to show fine detail is much higher in slow films than in fast ones. If you look through a magnifier at the size of the grains in a print made from slow film and then one made from fast film, you will notice that the grains on the faster film are larger and coarser than those shown on the slower film. Measured scientifically, slow films resolve more lines per millimetre than fast films. In fact, using slow film can be

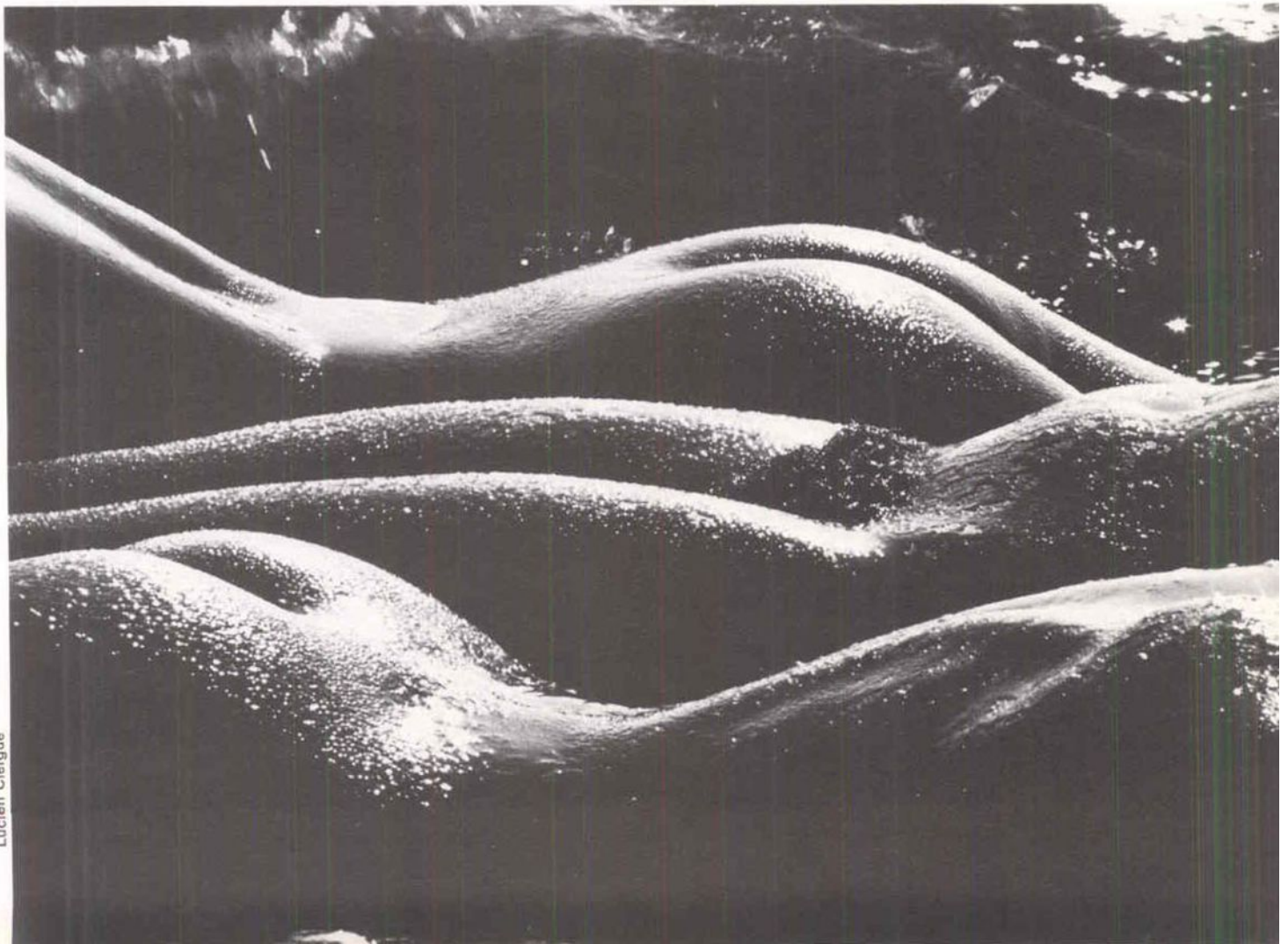


Pete Turner/The Image Bank

the 35 mm photographer's way of approaching large format quality. It is possible to achieve very effective results indeed from the smaller format provided that a fine-grained film is chosen, that focusing is accurate, that the camera is kept absolutely still, preferably with a tripod, and that the aperture is small enough to give an adequate depth of field. When working

in colour, it is important to remember that some films resolve detail more effectively than others. Kodachrome, for example, gives greater detail than other colour transparency films, such as the Ektachrome range.

Abstract nude This striking photograph exploits the texture of human skin as highlighted by the backlit water



Lucien Clergue

Black & white film and developer combinations

For most black and white photography, it is advisable to use just one film and developer combination and become familiar with its characteristics. But, sometimes, other combinations can be useful

Some photographers prefer to use a single type of universal developer for all black and white processing, rather than varying the developers to suit the film. This is certainly a cheaper and simpler approach and normally gives satisfactory results. However, by using a particular developer for a particular film you can often improve the quality of your negatives or alter the characteristics of the film to produce a desired effect.

Although modern 'standard' developers produce remarkably good results over a wide range of films, essentially they produce a compromise. No single developer can give the finest possible grain, the sharpest looking negatives, ideal contrast and any desired film speed change on every film. Nonetheless, a standard developer maintains a good balance between all these characteristics and is simple to use. But there are times when you may want to emphasize or play down one characteristic, and for this you need to buy a special purpose developer.

Most black and white film developers consist of either three or four main components dissolved in water. These are: developing (or *reducing*) agents which reduce the exposed halides of the film emulsion to metallic silver; an *accelerator* to provide the alkaline environment in which most developing agents work best; a *preservative* to prevent the developing agents from oxidizing and becoming inactive; and, sometimes, a *restrainer* to ensure that the developer acts only on exposed grains and thus prevents a fog from building up.

By using different chemicals or combinations of chemicals for each of these components, manufacturers can produce the precise qualities they want in a developer. Some developing agents, for instance, are very soft working and are ideal for high contrast subjects with plenty of fine detail. Others have a more vigorous action and can be used to accentuate contrast or to increase film speed.

Special purpose developers fall into three main categories according to the film characteristic they bring out. They are: *fine grain developers*; *high acutance developers* for sharp looking



Barry Lewis/Network

A problem shot With a difficult negative, top quality is only possible if you are thoroughly familiar with the capabilities of your chosen film and developer combination—here, a fast film and a speed increasing developer

negatives: and *speed-increasing developers*. Changes in the contrast range are also possible, but few special high or low contrast developers are available. You can make up your own if you want, but the changes are usually effected by altering the way you use a normal developer.

Fine grain developers

Graininess is rarely desirable in a negative and, for many photographers, a good developer should above all keep grain to a minimum, particularly with 35 mm film. As a result, standard developers are usually fine grain developers.

Fine grain developers do not, of course, actually reduce grain size—you can, in any case, only see individual

grains under a powerful microscope. Instead, they work softly and only partially develop the image so that there is a minimum of visible *clumping* of grains (see page 422). Unfortunately, the restricted development means that some fine grain developers cause some loss in effective film speed.

Among the better known fine grain developers are Kodak D76 and Ilford ID-11. These have proved so successful that they are now regarded as standard developers. They are commonly available and are very easy to use with a wide range of films without any loss in effective film speed.

The formula for both ID-11 and D-76 contains the developing agents metol and hydroquinone, which work better together than they do separately. Many

developers (known as MQ developers) contain metol and hydroquinone but, unlike other MQ developers, D-76 and ID-11 contain a low alkalinity accelerator, borax. A highly alkaline environment is needed to promote development, so the use of a low alkalinity accelerator gives a reduced rate of development. These developers are therefore soft working and give reduced clumping. The result is a fine grain negative.

Paterson Aculux is another easily used developer that gives fine grain results without any loss of film speed. In fact, Aculux produces an effective increase of about one third of a stop. Two particular advantages of this developer are the excellent range of tones it gives, especi-

ally with slow and medium speed films, and its effect in minimizing the grain of fast films.

When you want really fine grain results for very large prints, revealing texture and detail, you should be prepared to use an extra fine grain developer. This will cause some loss in film speed, however. Perceptol, for instance, may bring FP4 down to 64 ASA(ISO) from its normal 125 ASA—a loss of one complete exposure stop. If you want to use an extra fine grain developer, therefore, you must remember to allow for this loss of speed when exposing the film. Providing there is plenty of light on the subject, this should not prove difficult.

Whether you are shooting on slow, medium or fast film, extra fine grain developers like Perceptol give remarkably grain-free negatives. Of course, for the highest quality results you should use a slow, fine grain film and a good lens, but extra fine grain developers can coax fine grain results even out of fast emulsion, while maintaining a full tonal range.

High acutance

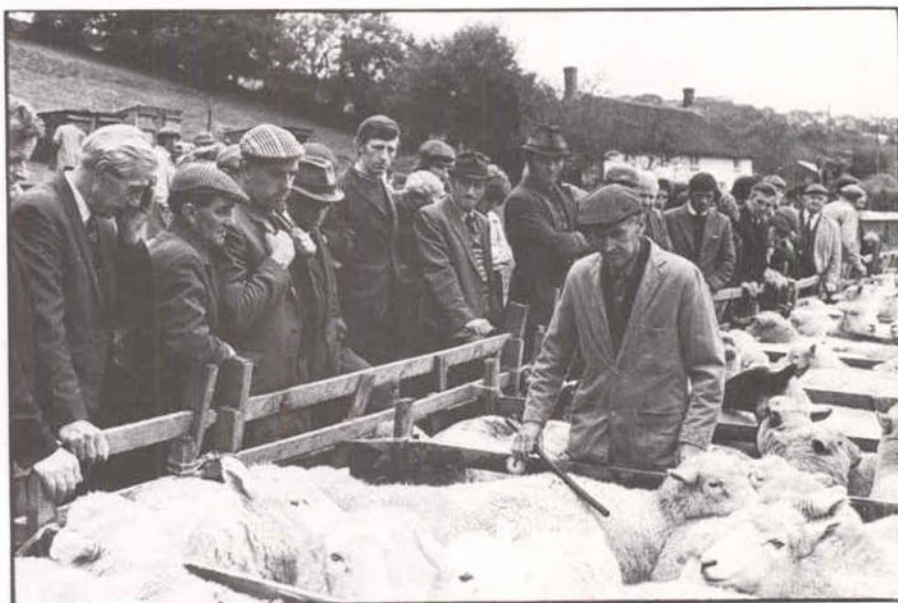
Modern fine grain films are capable of considerable enlargement without detail in the image 'breaking up', and modern camera lenses are capable of resolving extremely fine detail. Nevertheless, there are occasions when you may want

Standard combinations

Standard combinations use commonly available developers and film, and there is good reason why these remain popular. The films are established favourites because each is arguably the best in its speed range. The matching developer in each case is Ilford ID-11 or its exact equivalent, Kodak D76. These make the best all round use of the characteristics of the films. There is the additional advantage that considerable leeway is possible in processing. Other 'standard' developers include May & Baker 320, Paterson FX-18 and Agfa Final, all of which are made up from powder form. Those in liquid concentrate form include Paterson Aculux and Unitol.

Market day for general purposes Ilford FP4 + ID-11 is a difficult combination to beat. Normally used in the form of a reusable stock solution, good results are also possible by diluting fresh stock and using this once before discarding

James Ravillious/Beaford Archive

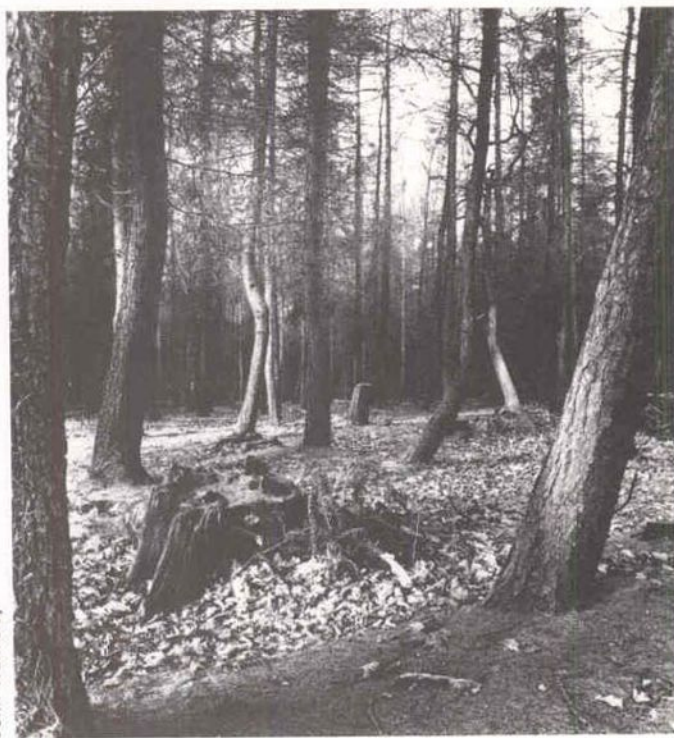


Potter If you have to photograph under poor lighting conditions, your standard combination ought to include a fast film such as Tri-X

In the wood For really fine grain and sharpness, you can simply change to a slow speed film such as Panatomic-X and keep using a standard developer such as ID-11 for a crisp grain pattern with no speed loss

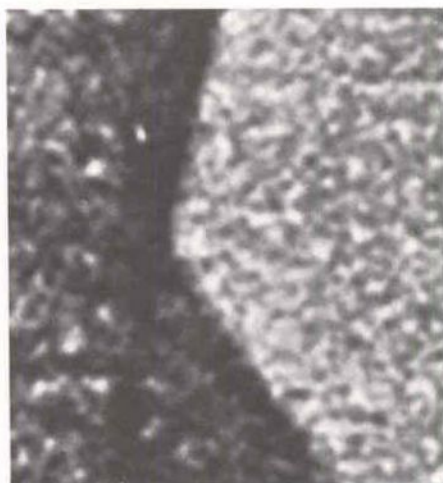


John Walsley



Barry Lewis/Network

Combinations for maximum sharpness



Man at table The impression of sharpness conveyed by FP4 + Acuspecial is achieved by the 'adjacency effect' which emphasizes the boundary between light and dark detail

A slow or medium speed film is essential if you want really sharp, almost grain-free results. Where fine grain is of paramount importance, use a special developer which inhibits the clumping of silver grains within the image. True fine-grain developers are essentially soft working. This sometimes means a slight loss in effective film speed. Although most standard developers give fine grain, better results are obtained from developers such as Kodak Microdol-X, Agfa Atomal, Tetenal Ultrafin and Ilford Perceptol. An essential part of the combination is the film: consider using a slower than normal film in conjunction with one of these developers.

Acutance developers may also be used as they increase the apparent sharpness of an image. Some developers, such as Paterson Acuspecial have marked acutance properties. Others, including Paterson Acutol, Neofin Blue and Red, Definol and Agfa Rodinal offer characteristics between this and standard developers

Scrapyard A stunningly sharp print from the sort of negative you could expect from a combination such as Panatomic-X + Paterson Acutol



Barry Lewis/Network

the picture to look exceptionally sharp. Shots of machinery, for instance, may need to be pin sharp to retain their impact. In this case, it is worth using a high definition/acutance developer.

Modern high definition developers retain detail by concentrating development near the surface of the emulsion to ensure that clumps of grains are kept as distinct as possible and do not merge vaguely into each other. This is usually achieved by using a highly active developing agent and a high alkaline accelerator.

High acutance developers also help to create an illusion of sharpness by emphasizing edges in the image. In the past, this was achieved by using a very dilute solution and minimum agitation. This caused a localized exhaustion of the developer wherever dark and light met, giving an impression of sharpness but resulting in a compressed range of tones. With modern high acutance developers, however, boundaries between dark and light are emphasized chemically to give a very sharp looking picture with little tonal compression.

Many modern film developers have some high acutance properties but special high acutance developers will produce particularly high definition. These developers work well with slow and medium speed films up to about 200 ASA. There is little point in using them with fast films because the extra grain more than offsets the extra edge definition. With slower films, however, the overall look of sharpness achieved means that you only notice the increased grain at the major tonal boundaries by peering very closely.

Two bath developers

Many developers have a 'compensating' action which can handle excessive subject contrast quite well. Two-bath developers offer this as a principal characteristic and also have other equally appealing 'extras'. As the name suggests, these consist of a two-part solution, and the film is developed in two stages, spending part of the overall development time in each solution. Most of these solutions are reusable and last indefinitely without losing their strength. Some, like Baumann Diafine, offer the enormous speed increase of three stops.

Increasing speed

If a film has been inadvertently underexposed, or it was knowingly underexposed because of poor lighting conditions, there are several methods for salvaging the shots. These include

slightly extending the developing time, changing to a different type of developer, increasing time and temperature, or any combination of all of these.

While various developers give an effective increase in film speed by increasing the development (push processing), you cannot increase the developing time and temperature without increasing contrast and overall density as well. With greatly extended development, contrast may become unmanageable. Special speed increasing developers are designed to make the fullest use of the exposed grains in the shadow areas of the image without producing excessive contrast, although some increase is inevitable.

Some developers, not designed specifically to increase film speed, give an extra half to one f/stop increase because of their chemical make-up.

Paterson Acuspecial is one such developer. Used in combination with a slow or medium speed film it gives an effective increase of half an f-stop, combined with enhanced image edge definition and fine grain.

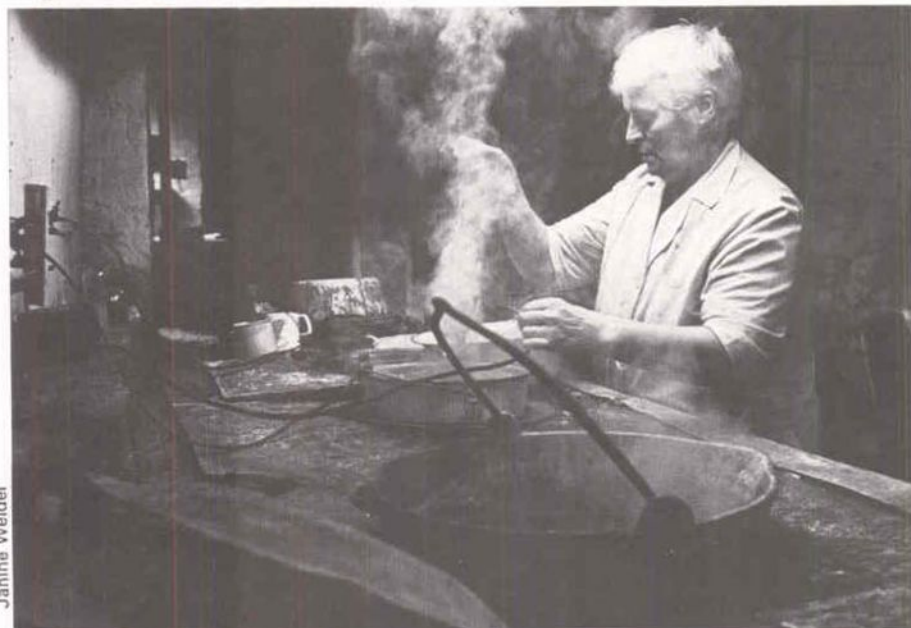
On the other hand, Paterson Acuspeed has been formulated for raising film speed. Acuspeed gives an effective speed of 1250 ASA with 400 ASA films such as Ilford HP5 and Kodak Tri-X. The resulting negative has slightly more grain, but is still fairly sharp.

Another speed-increasing developer is Ilford Microphen. When it is used with Ilford HP5, for example, effective speeds of ASA 1600 or even ASA 3200 can be achieved by extending the developing time. This developer has excellent keeping properties and may be diluted 1:3 when maximum image sharpness is required.

Getting the most out of your film

Some speed-increasing developers are designed to extract every last bit of speed from an emulsion. They are 'energetic' in action and tend to produce images with comparatively high contrast, so they should not be used in combination with slow films. Sharpness, however, is often good. Other speed-increasing developers actually offer sharpness as a secondary characteristic, but their speed increase is not nearly so marked. Except for these, speed-increasing developers inevitably increase the graininess of an image, and in some cases promote an excessive level of fog unless care is taken during processing.

Steam For just a small speed increase in a situation where a fast film can be used close to its normal rating, try a combination such as Ilford HP5 + Ilford Microphen to retain quality. This yields a rating of 650 ASA

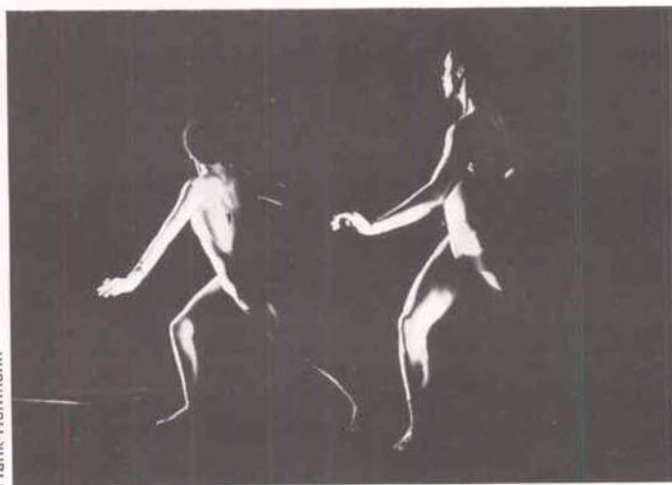


Janine Weidel



Frank Herrmann

Portrait If far more speed is required, try a combination such as Tri-X + Paterson Acuspeed. This gives a rating of 1250 ASA—a useful figure for available light photography. Use a stop bath between developer and fixer to prevent fog

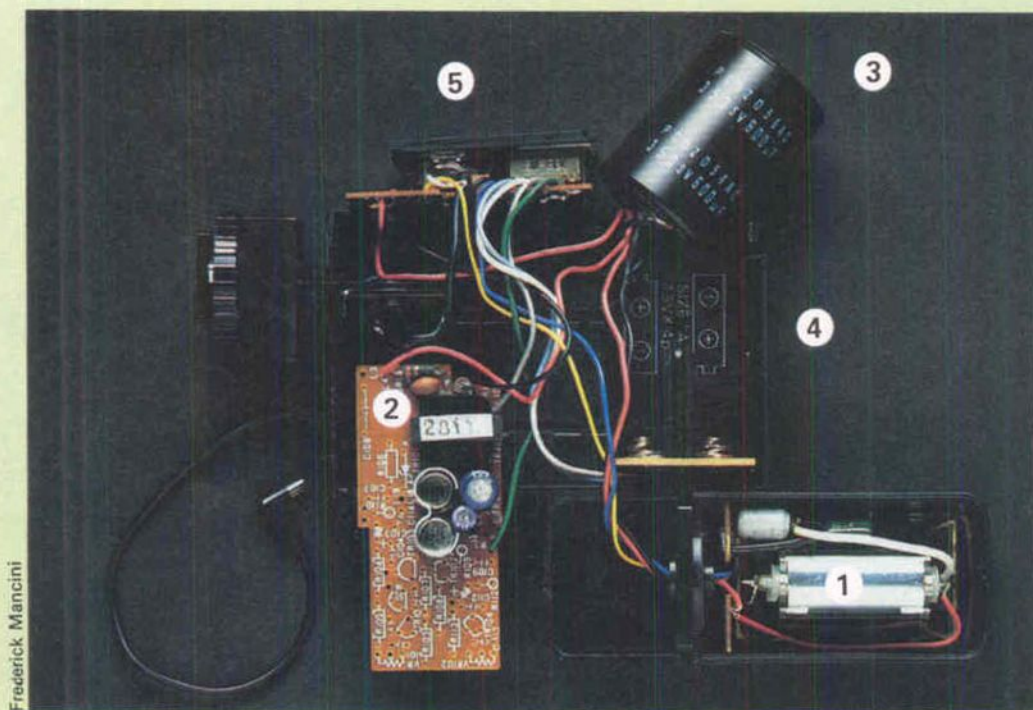


Gwendoline Patmore

Dancers Where you are confronted with unpredictable and very low lighting conditions, try a combination such as Tri-X + Baumann Diafine—a two-bath developer which offers great speed increase (3200 ASA) and good quality

How flash guns work

Flashguns are fairly simple pieces of equipment, but knowing how they work may enable you to identify problems when they crop up and help you use a flashgun much more creatively



Frederick Mancini

Most natural sources of light are easy to understand. Everyone knows that hot, burning objects glow brightly, and it is easy to think of the sun as a large ball of fire. Even light bulbs are quite straightforward—basically a white-hot glowing wire.

Lightning is different, and it has a lot in common with electronic flash. Both sources of light last only for a fraction of a second, both freeze moving objects that they illuminate, both give off a very bright light, and both lightning and flash are produced by a sudden discharge of electrical energy.

Unlike lightning—or any other form of natural light—electronic flash is under the control of the photographer. This, of course, is what makes it so useful. The way that the flash is generated is quite simple. It relies on the behaviour of certain rare gases, which only conduct electricity under certain conditions—and when they do, the electrical current flows in a very rapid surge, being converted to a bright light-flash for a fraction of a second.

Flashgun components Despite their complex construction, manual flashguns are quite simple. These parts are numbered in the picture: 1 back of flash tube; 2 oscillator and rectifier circuit, with spaces on printed circuit board for automatic flash components; 3 main capacitor; 4 battery compartment; 5 ready light

The heart of a flashgun is a toughened glass tube containing the gas *xenon*. The shape of the tube varies. In most small flashguns it is short and straight, though in large studio flash units it is a spiral-shaped coil.

Tungsten electrodes are fused into the ends of the tube, and wires join them to an *electrical capacitor*. This is a device which stores electrical charge, and the difference in voltage between the two terminals of the capacitor (and, therefore, also of the flash tube) may be as high as 500 volts. No current flows through the flash tube because, in its normal state, xenon does not conduct electricity.

Before it can conduct, the atoms of xenon must be ionized—given an electrical charge. This is done by a wire wrapped around the flash tube. When a pulse of

high voltage current flows through this coil, the atoms of xenon are ionized, and the charge in the capacitor flows through the gas—producing the flash.

The pulse that flows through the wire around the tube is called a *trigger pulse*, and is produced by a trigger circuit. It is this circuit that is connected to the flash contacts of your camera, though the full trigger pulse does not flow through the camera. If it did, the high voltage would quickly burn out the contacts. Instead, a low voltage pulse flows when the shutter of the camera opens (see page 85) and this is then boosted by a transformer to a much higher level—thousands of volts.

Dangerous power

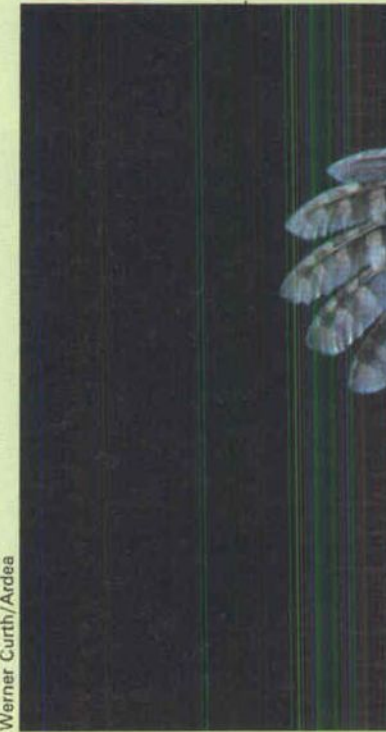
From this simplified description, one thing stands out. Even the simplest of flashguns, including the tiny units

that slip into the camer's accessory shoe, make use of extremely high voltages and on no account should you attempt to repair or dismantle one, however innocent and harmless it might look. The capacitors in a flashgun retain a charge long after the unit has been switched off, and the stored power is sufficient to throw you across the room should you touch the wrong part. This is why only a small pulse of voltage is passed through the camera.

Sources of power

Although flashguns operate at very high voltages, the power supply is usually of quite low voltage. A typical power supply is four 1.5 volt pen cells, producing a total of six volts. To operate the flashgun this must be stepped up several hundred times.

It is not possible simply to step up the power from the batteries directly through a transformer, because transformers only work with alternating current (AC), and batteries produce direct



Werner Curth/Ardea

current (DC). Consequently, the power from the batteries must be fed into an *oscillator*—an electrical device that changes the DC of the batteries into AC. The AC output can then be passed through a transformer to increase the voltage. The oscillator is the part of the flashgun that makes the familiar high pitched whine that you hear as the flashgun recycles between flashes.

A further problem arises at this stage because, unlike transformers, capacitors work on direct current. The AC output from the transformer must therefore be changed back to DC in order to charge the capacitor. This is done with a *rectifier*, which acts like a valve and only allows current flowing in one direction to pass through it.

Ready lights

When the capacitor reaches a certain level of charge—usually about 70 per cent—a neon light is illuminated on the back of the flashgun to indicate that the flash is ready to be fired. Most flashguns will fire before the light comes on, but underexposure will usually result. If maximum power is required, it is best to wait until the capacitor reaches full charge. This point can be recognized by listening to the whine of the oscillator. When the capacitor is fully charged, the oscillator cuts out, often with an audible

click. Wait for this sound if you need maximum power from the flashgun.

Computer flash

The majority of modern flashguns are automatic or 'computerized'. A light sensor on the front of the flashgun collects the light reflected back from the subject, usually from a small central section of it. When the reflected light reaches a sufficiently high level, the flash is quenched. In the case of ordinary computer flashguns, the remaining power is directed into a quench tube. This is just like the main flash tube, but it is concealed within the case of the unit and painted black.

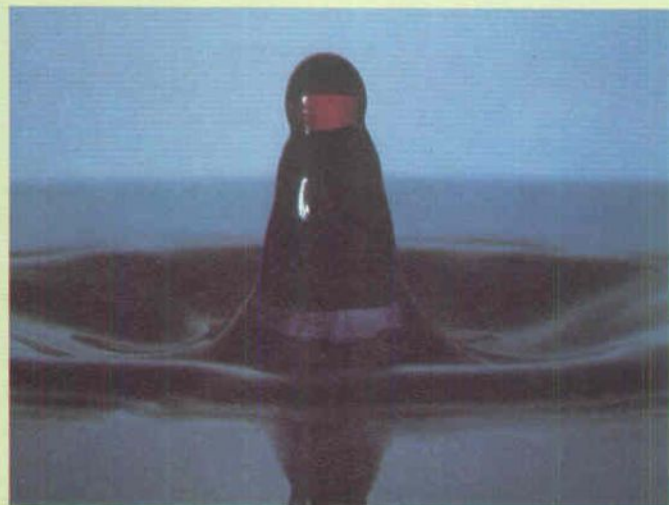
The most modern computer guns employ an electrical component called a thyristor. This device interrupts the flash circuit as soon as the exact amount of charge required for the flash has been released. Any excess charge is not wasted, instead it remains in the capacitor, ready for the next flash exposure.

There are flashguns designed for use exclusively with some types of cameras. These are called *dedicated* flashguns. When such a flashgun is fitted to the camera's hot shoe, shutter speed is automatically set to 1/60 sec. The flash's ready light also appears in the camera's viewfinder, making it unnecessary



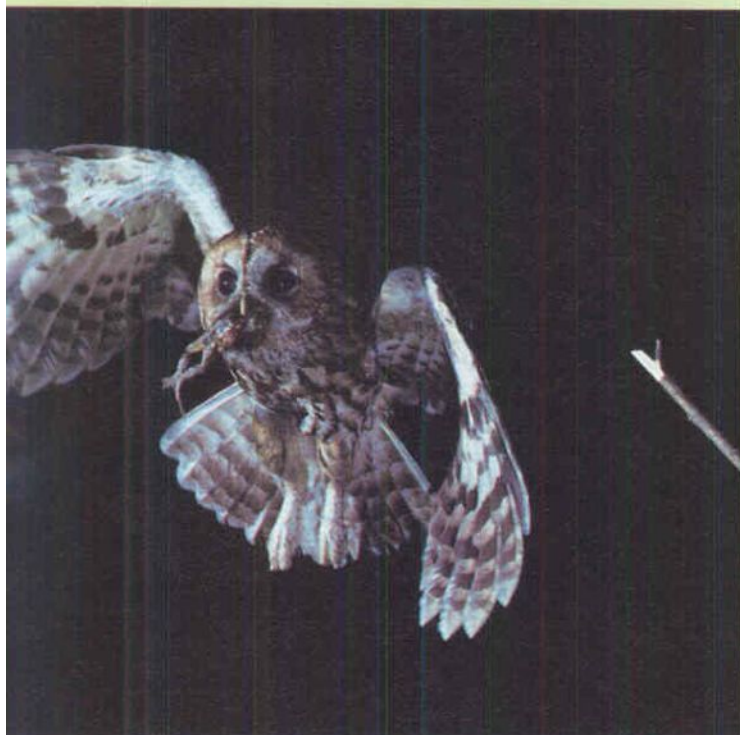
Frederick Mancini

Freezing motion Automatic flashguns can freeze motion at short distances. Manual flashguns are less efficient at freezing fast moving subjects (left)



Dr D. Gorham & Dr I. Hutchings/Science Photo Library

Water drop This was frozen by a flash with a duration of only 1/7,000 sec. **Owl in flight** Electronic flash produces a far shorter exposure than a mechanical shutter, so it is widely used in nature and scientific photography. This enables the photographer to freeze the movement of fast moving birds and animals and to use high shutter speeds



for the photographer to look away from the subject in order to check the flashgun.

Flash power

The power of the flash from a small flashgun would be very low if the flash tube was left completely exposed, so all guns use an efficient reflector to direct the light forward. In effect, this increases the illumination.

The power output of large professional studio flashes is measured in *watt seconds* or *joules*. Many large studio units generate as much as 15,000 joules of power. Compare this with the output of small portable flashguns—the average hot shoe flashgun gives a flash of 25 joules.

Guide numbers for flashguns bear no direct relation to the actual power output of the gun, and give only an estimate of the correct exposure in the average room

(see page 196). They cannot be relied upon for exact exposure.

When professional photographers use flash in a studio, they often take a flash meter reading, followed by a Polaroid test shot, and then take four or five pictures on film, just to make sure that one of them is correctly exposed. While few amateurs would go to such lengths to get a picture, it serves as a reminder that even the most sophisticated modern flash units are still not as reliable as the light from the sun!

WARNING

The flashgun shown here was dismantled by a skilled technician. It can be very dangerous to open the casing of even small units, because they store high voltage

Improve your technique

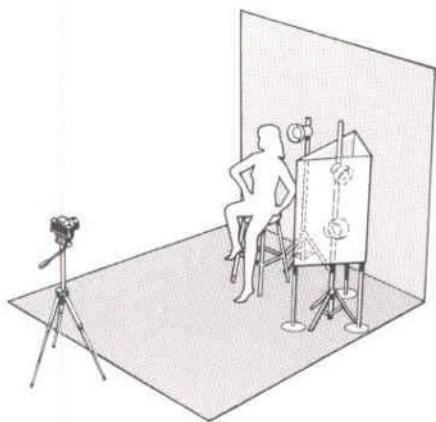
Studio lighting-2

The essence of lighting technique is control. Knowing how to use a few extra lamps in your home studio can help you to make the most of your subject, particularly for portraits

Excellent results can often be achieved with just a single light, but by learning to use several lights you can significantly increase your control over the appearance of the subject. While with a single light you can only really make broad changes in the way light and shadow falls upon your subject, several lights can produce more subtle differences in illumination. With additional lights you can highlight some features within the subject and subdue others to achieve precisely the effect you want.

Simple studio lighting can be used for a wide variety of subjects. Portraits are particularly popular and provide a good starting point for learning the principles of studio lighting. Other subjects, from glamour to glassware, are covered in detail in subsequent articles.

Before you begin to work with several light sources, you should be able to handle a single source confidently (see page 408). Once you have mastered lighting with a single light, you can begin to add extra lights to your set-up. Successful handling of multiple light sources involves adding one light at a time and gauging the effect of each addition. But you should never use more lights than absolutely necessary. The best shots are generally lit with few lights rather than many. Do not add the extra light until you are sure you cannot achieve the desired effect with those you already have.



Lighting control Diffused light from two lamps in a reflector placed behind tracing paper on the right, and a back light to shine through the hair and frame the face, give a flattering picture. Lively posing helps the total effect

Julian Calder



It is essential to have a clear idea of the type of shot you intend before you start moving lights around. Otherwise you may waste a good deal of time and effort and try your sitter's patience. With a straight head-and-shoulders portrait, you should sit your subject down on a stool or chair and set the camera on a tripod. You can then frame up carefully and leave the camera in position while you adjust the lights and coax the right sort of expression from your sitter.

Natural lighting usually comes from one main source such as the sun or a window, although there are many minor sources of reflected light. So for a portrait to look natural, studio light must also appear to come from a single principal source. You need just one main light, usually diffused with a broad floodlight reflector, to set the key for the picture. Other lights must never be allowed to compete with the main light if you want a natural look to the photograph—they must simply complement it. It may be, of course, that you do not want a natural look, in which case you can abandon this rule. But for normal portraits, you should establish the main light first.

Setting up the main light follows largely the same process as that outlined for single source lighting, although with extra lights available to fill in deep shadows, slightly more extreme positions can still give natural looking results.

Nevertheless, one particular lighting set up has become widely accepted for conventional portraits, and provides suitable illumination for a wide range of sitters. The main light is positioned in front of the sitter and to one side and pointing down towards the face at an angle of 45°. With the right additional light, the effect is natural and revealing.

Unfortunately, although this lighting arrangement shows up the subject well, it tends to give rather flat results if the sitter faces the camera directly. Most photographers prefer to move the camera round to shoot obliquely at the subject. If you decide to do this, it is probably better not to move the camera but to ask the sitter to turn his or her head slightly and then move the lights accordingly.

As the subject turns away from the camera, however, the effect of 45° lighting changes. If the light is to the left of the subject and the subject turns to the left, the light is then on the far side of the face from the camera. It shines across the face and, for the camera shooting the shadowed side of the face, much less of the face is illuminated. Only the more prominent features—forehead, cheeks, nose, chin and so on—are brightly lit and the effect is to make the face look narrower than usual. So if you have a subject with a broad face, you may be able to make it look narrower by using this form of lighting.

If, however, the light shines on the side of the face nearest to the camera, much more seems to be illuminated and the effect is to make the face look broader

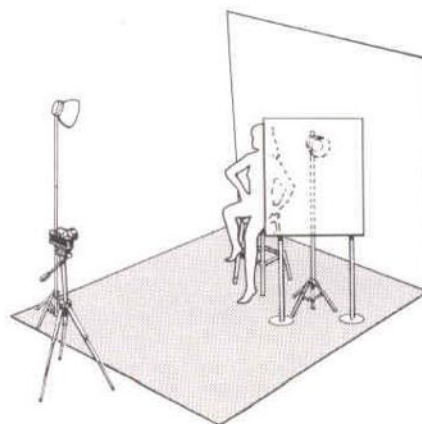
and flatter. Very little textural detail is revealed and this type of lighting is better when you want the appearance of a smooth complexion. But unless the subject has sharp, narrow features, fill-in lighting should be kept to a minimum to stop the face appearing too broad and flat. You can play down or emphasize either of these techniques—broadening and smoothing with the light on the near side of the face, narrowing and accentuating texture with the light on the far side—by moving the light through different angles.

Fill-in light

Once the main light is positioned, you must set another to fill in the shadows to prevent them becoming too deep. The best place for this light is usually fairly close to the line between the camera and subject, on the opposite side of the camera to the main light. Move it around from this position until the unpleasantly deep shadows are softened.



Directional light Strong light from the front gives direct main lighting on the subject. A weaker lamp, with a reflector board to the side of the model, gives a similar effect to a broad floodlight fill-in

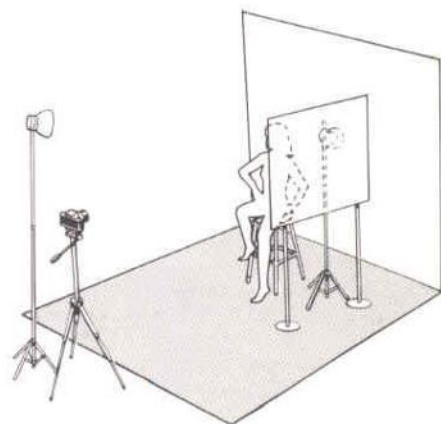


Normally, even if the main light is a sharp spotlight, the fill-in should be a diffused flood light. If the main and fill-in are equally bright, the fill-in should be placed one third further away from the sitter than the main light. If the fill-in is only half as bright as the main light, it should be set at approximately two thirds the distance.

You can decide when the amount of fill-in is correct by making measurements in the way shown in the article on single source lighting. However, with a fill-in light, you can measure the effect of each light separately and this is usually easier. Simply switch on the main light, take a light meter reading and switch off. Repeat the process for the fill-in light. The difference in exposure in f-stops gives an idea of the contrast in the subject after the fill-in has been added. The range of contrast needed depends on the subject: for those which require a soft effect, such as babies and girls, the difference in exposure settings



Broad light Moving the directional lamp further back and around towards the camera axis changes the effect. The reflector board has also been moved, so that most of the light comes from the right of the picture



Julian Calder

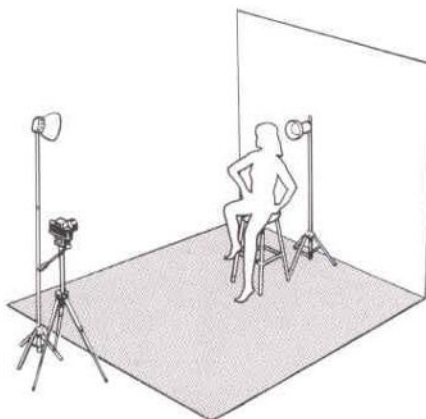
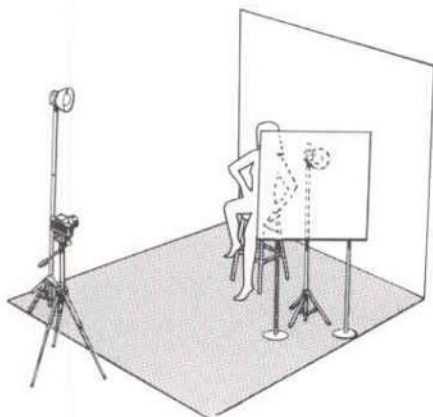
Advertising Arts



Lighting angle A minor adjustment to the position of the main light and to the pose of the model gives a major change in mood. Both direct and reflected lights are now at similar angles to the subject



Rear light Placing a light directly behind the model hides it from the view of the camera and gives a glamorous halo effect. The main light is placed high up and almost directly behind the camera for frontal illumination



should not normally be more than 1 to $1\frac{1}{2}$ f-stops. With older men, and shots where you want to emphasize masculine character, you can afford to give $2\frac{1}{2}$ to 3 stops. Only for really unusual, dramatic effects should the difference be four stops or more.

Remember to allow for the skin tone of your subject when estimating exposure, however. If your subject is very dark skinned, the exposure meter tends to over-compensate. This does not matter with black and white film, but with colour slide film, you should aim to underexpose by one f-stop.

Additional lights

In addition to the main and fill-in lights, many photographers add a number of other lights to produce special effects and enhance the picture in small but important ways.

One of the most popular extra lights is a hair light. With only two lights, even the healthiest hair can look dull and

uninteresting. The hair light is added to introduce highlights into the hair and make it glisten brightly. It is usually set in one of three places—either above the head, above and to one side, or to one side and level with the head.

Exact positioning is important, particularly with an overhead light. If it is forward of the crown, light can spill onto the face and upset the shadow pattern. Arranged directly above the crown, it produces a pancake of light on top of the head that is rarely flattering. Ideally, it should be set a little behind the crown so that light is reflected brightly through the strands of the hair.

Hair light is most effective on brunettes and people with thick hair. Very light blondes need little hair emphasis, and if you use a hair light with people who are slightly balding, it may show up the very feature they want to hide.

A well shaded domestic lamp will often provide a good hair light, but if this is suspended from the ceiling it should hang low. Move your subject around until he or she is correctly placed in relation to this light. A proper spotlight is better but it can be very expensive. A spotlight can direct a beam of light upon the sitter from several metres away.

Another light can be added to illuminate the background. If you have not arranged a special background this light is unnecessary. It is better to sit the subject well away from any walls and leave the background dark. Dark backgrounds do not suit all subjects, however, and you may want to use a light background. More interesting backgrounds can be used, providing they do not distract from the subject, but for straight portraits a very smooth plain surface is probably best. A plain white painted wall is ideal. If you cannot find a suitable wall, you may have to buy a roll of special background paper from a photographic supplier.

It is very easy to set up the lights to

Portrait lighting step-by-step

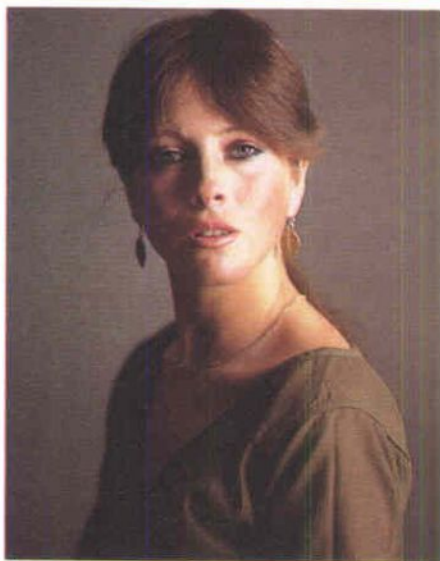
Building up an arrangement Three lamps are enough for most types of portrait.

1 A main light with a broad reflector is placed to one side of the model to illuminate the important features

2 An accent light behind, and on the other side, adds extra highlights and brings out form more strongly.

3 Accent light and main light are not enough on their own, however. There are several distracting shadow areas that should also be dealt with.

4 The answer is to add a third light almost in line with the camera. This serves as a fill-in to lighten the shadows without overpowering the other lights



illuminate the head and forget about the background. While this does not matter with a dark and distant background, a light background will pick up various distracting shadows from the front lights, particularly if it is close behind the subject. Ideally, the subject should be placed as far in front of the background as possible.

In small studios where there is little room for manoeuvre and a shadowed background is unavoidable, the background light is often used to kill the shadows in the background. It must be a very strong light and the background will appear very bright.

Even where the background is sufficiently distant to avoid unpleasant shadows, the background light can be used to brighten the background so that it complements but does not compete with the subject—there should be at least one stop difference in the readings between the background and the subject.

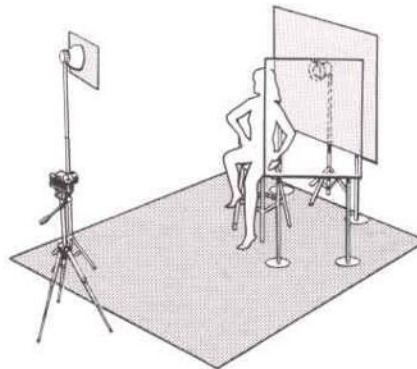
A popular effect is to place the background light on the floor and point it upwards so that the background is light at the bottom but gradually darkens towards the top. This helps to 'frame' the subject, and the dark top of the background contrasts with the hair light.

You can place the background light in many positions, but prevent stray lights and trailing wires from intruding into the picture. The light can even be set behind the backdrop, shining through it. This can produce a soft, even circle of light around the head and avoids awkwardly placed lights near the sitter.

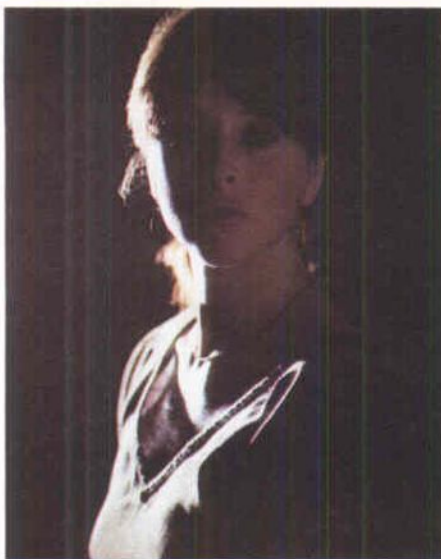
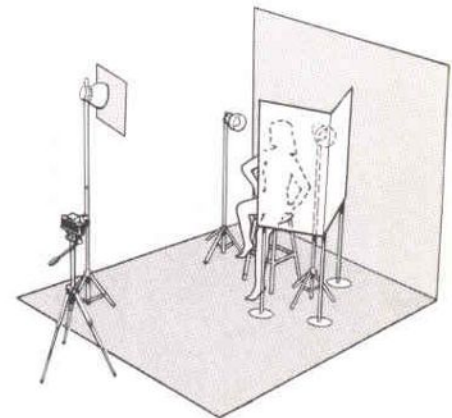
Other lights can be added both in front and behind the subject to create small bright highlights and to give the picture extra sparkle. A small spotlight aimed on the cheek to reflect straight into the camera is a good example. You find the correct position for this light by setting the spotlight right by the camera. Have your sitter hold a small mirror right on the spot to be highlighted. Then walk around the sitter until you see the



Tracing paper diffusion A sheet of tracing paper is used as a background, and light is directed through it towards the camera. Another sheet of tracing paper over the main light gives a final result that is both soft and high key



Three lights The result of the lighting in the sequence below. The main light comes from an angled reflector, while the accent light is provided by a small spot. Tracing paper is used to diffuse the fill-light



2



3



4

Julian Calder

Advertising Arts

Julian Calder



Fidel Castro Karsh's skilful use of portrait lighting techniques emphasizes the sitter's strong personality

image of the spotlight reflected in the mirror. The spotlight should be placed where you are standing when you see this reflection. Position the spot carefully and check through the viewfinder.

Other lighting schemes

Once you have experimented with conventional portrait lighting, you can try other techniques. Ideally the lighting should be tailored to suit your subject, and although formal portrait lighting arrangements usually work well, there are times when a different arrangement is more suitable.



Julian Calder

Head and shoulders Lighting your subject is important, but remember that variations in pose and framing can have just as great an effect on the picture

'Glamour' lighting uses exactly the same sort of arrangement as 'standard' lighting, but the main light is taken further back and the fill-in light is the more dominant. First switch the angled light off to ensure even coverage of the features by the main light, then bring the fill-in light slowly forward until shadows begin to appear. The correct position can be found by very carefully moving the fill-in light back again until the shadows just disappear.

Another example is a form of lighting named after the well known portraitist Karsh. This consists of lights placed either side of the sitter equally illuminating both sides of the head. Each light is positioned individually, lighting only one side of the head, then both are turned on together. If all has gone well, an extremely effective form of lighting will be achieved, flattering to the sitter but not corresponding to that usually seen in real life. Great care has to be taken in positioning the lights: they should both be of equal strength and at equal distances each side of the sitter and from the camera. With a full-face shot, if the lights are set too far back they produce a black line down the centre of the nose, but if too far forward, awkward looking shadows will spoil the result.

An important point to bear in mind while you are experimenting with different lighting arrangements is that your subject must be comfortable, relaxed and happy if you are to achieve good results. Even if you are only experimenting you should try to appear confident, so that your sitter does not become impatient. Plan the pictures and the different lighting arrangements you are going to try before you set to work, you should be well rewarded.

Karsh of Ottawa/Camera Press



Improve your technique

Special effects

There is more to photography than just representing your subjects in a realistic way—interesting and unusual effects can be achieved



Victor Watts

camera is very simple, but on modern cameras you have to make a few adjustments to expose the same piece of film twice or more.

Some cameras have a special multiple exposure control which allows you to press the shutter any number of times before winding on. On others, you have to 'fool' the shutter/winding mechanism link. You should check the camera's instruction manual to see if the manufacturer recommends any particular way of doing this.

One method is as follows: tighten the film in the camera by turning the rewind knob until firm resistance is felt. This helps to ensure that the film stays precisely in place for the second exposure. Make the first exposure. Press the rewind button and hold it in place while you wind on the film advance lever. With most cameras, this resets the camera shutter without winding on the film and you can expose the same frame again by pressing the shutter release.

You can repeat this sequence to make several exposures on the same piece of film, but the film may begin to slip out of register after a couple of exposures. Even with just two exposures you should take extreme care to ensure that the film does not move at all.

There are very few cameras with which it is impossible to make multiple exposures, although with some you may have to resort to advancing the film one frame and then winding back. You can calculate the correct exposure for multiple images very easily. The idea is normally to underexpose each part of the multiple exposure so that the total exposure of the frame is the same as for a single normal exposure. With most cameras and subjects, the best way to do

Monky business *Electronic flash lit the subject at the start of a time exposure in a darkened room. The halo is a circular fluorescent tube switched on briefly behind the subject's head, and the glowing outline was given by a hand held torch and a starburst filter*

Triple portrait *A straightforward triple exposure by electronic flash, made by moving the subject against a black background to prevent overlap when the flash fired*

You may think it requires sophisticated equipment to take the kind of photograph that shows a moving dancer as a series of ghosted images—or that you have to be a darkroom wizard to produce a picture that shows the same person twice in the same shot. But these and many other special effects can be achieved very easily on the vast majority of cameras with simple exposure variations and a few very basic and inexpensive accessories.

Two principal techniques are involved in producing these special effects: exposing the same piece of film more than once, or *multiple exposure*; and long exposure times. The only essential

piece of additional equipment is a tripod. Although hand-held shots are sometimes feasible and it may occasionally be possible to improvise a support for the camera, a tripod minimizes the problems of proper framing and smooth operation for special effects.

Multiple exposures

Exposing the same piece of film twice used to be a common beginner's error. Now cameras are specially designed to prevent this happening—the shutter is linked to the winding mechanism so that you cannot press the shutter again until you have wound on to the next frame. Making multiple exposures on an old



Marek Habdas/Vision International

this is to multiply the ASA (ISO) rating of the film by the number of exposures you intend to make on a single frame, and set the new rating on the exposure meter or film speed dial. If you want to make a double exposure, double the film speed. If you want to make a triple exposure, multiply the film speed by three—effectively giving each frame a third of the normal exposure. With the new film speed set, the exposure that your meter indicates is then automatically correct.

An occasion when you should not use this method is when making multiple exposures of a brightly lit subject against a completely black background, with each new image superimposed on the dark background—spotlit figures on a dark stage, for example. In such cases, make each exposure at the normal rating for the film, preferably basing the exposure on a light reading taken from the subject itself.

If you alter the ASA setting on your meter, always remember to reset the correct rating when you have finished making multiple exposures.

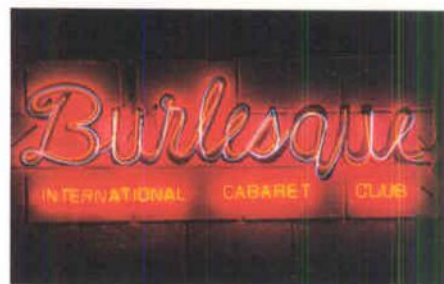
Multiple subjects

Multiple exposures can be used in a variety of ways. You could, for example, make two exposures of the same subject from different points of view. Or you could use a medium or long telephoto lens to make two exposures, one in focus and the other out of focus. This can be particularly effective when photographing flowers, but you need a tripod to ensure that the framing for both exposures is identical.

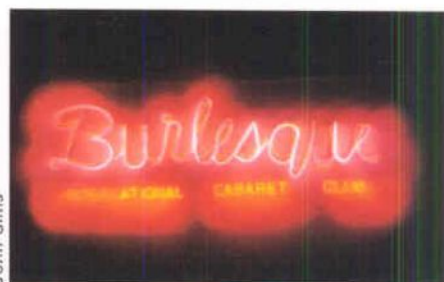
Another technique is to use a zoom lens (again on a tripod) to superimpose two exposures made at different focal length settings. Experiment with such techniques to discover the possibilities.

Waterfalls and fountains are good subjects for multiple exposure shots. Rather than freeze all movement with a high shutter speed, many photographers prefer to use long exposures when taking pictures of waterfalls to show the movement of the water over the rocks. This can be effective and gives the fall a beautiful ethereal quality, but it also looks rather unreal. A multiple exposure can prove an attractive compromise between the frozen image with a high shutter speed and the unrealistic image with a slow shutter speed. Set the camera on a tripod and make a number of exposures on the same frame—up to eight—using a high shutter speed. In the final result, the water will have much of the solidity of a high shutter speed shot, with individual drops of spray visible, but the multiple images will also combine to suggest movement. Multiple exposure pictures can be made on other occasions where the main subject is stationary but where there are moving details. Those parts of the scene that move between exposures register in the final photograph in an unnatural but often fascinating way. Again, a tripod is essential to prevent camera movement.

In the late 19th century, an entire photographic sub-industry grew up to manufacture 'spirit photographs', an amusing application of multiple exposure technique that is easily performed. A suitably dressed 'ghost' is posed in an



Neon sign A straight shot taken at night on colour slide film, with the camera set on a firm tripod



Focus change For half the exposure time the camera was used normally. Then the focusing ring was turned to give a blur

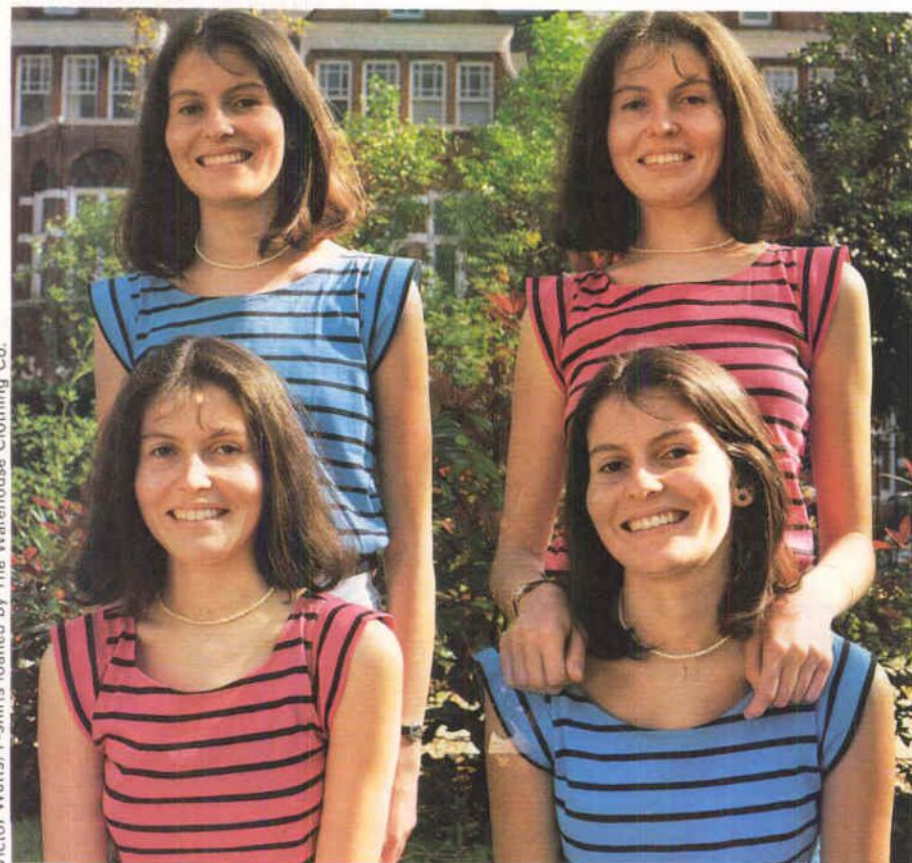
appropriate scene. Two exposures are made on the same frame, one with the 'ghost' in position, one with the 'ghost' removed. The final picture shows a normal scene with a semi-transparent figure included.

A more modern variation on such trickery is multiple exposure with masking. By covering half the lens with an opaque mask, making an exposure, then moving the mask to cover the other half of the lens and making a second exposure on the same frame, it is possible to make pictures in which the same person appears twice. The model is simply moved from one half of the picture to the other between exposures.

A mask can easily be cut out of black cardboard, but it is better to use one made by a filter manufacturer since precise registration between the two images is needed. Suitable masks are made by manufacturers of square 'system' filters. The depth of field of the lens will have an influence on the sharpness of the dividing line between the two halves of the picture. Telephoto lenses should be set at a small aperture to give good separation between the two halves. With through-the-lens metering systems, always take an exposure reading before putting the mask in place, using the correct film speed setting.

There are occasions when you can use successful multiple exposure effects without a tripod. If you have a camera with a motor winder and a multiple exposure control, you can produce

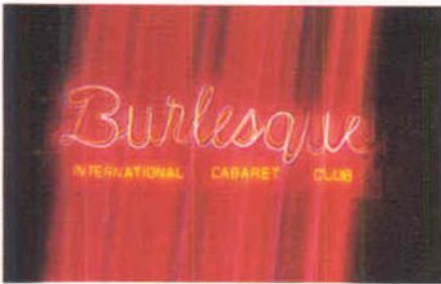
Quads Double exposure with a mask to divide the picture down the centre. To produce four images of one face, it is easiest to use a pair of identical twins as models



Victor Watts/T-shirts loaned by The Warehouse Clothing Co.



Zoom The zoom control ring on an 80-200 mm zoom lens was moved as smoothly as possible during exposure



Tilt After an initial steady exposure, the camera was carefully tilted up and down to give a streaked effect

interesting multiple exposure effects with a hand-held camera. Such effects are most easily produced with those cameras that have automatic shut-offs on their motor winds, so that you can pre-set the number of exposures that are made. The result is a recognizable but jumbled picture of your subject.

If you have a sophisticated camera that allows you to change focusing screens, it can be useful to put a ruled grid screen in your camera when making multiple exposures. This helps you locate the separate images correctly in the frame to avoid overlap.

Flash techniques

Although the most obvious way of making a multiple exposure is to fire the shutter a number of times, you can also make a multiple exposure by holding the shutter open for a long time and illuminating the subject briefly a number of times. The simplest way of doing this is to use electronic flash and a time exposure. For each 'exposure' the flash is fired once to record the image.

This technique is usually used in a darkened room under controlled conditions, but it is also possible to use similar techniques outdoors at night. With a moving subject, multiple exposure with flash produces a series of frozen instants recorded on the film. This can be useful for analyzing motion, or purely for graphic effect. The technique is used commercially for subjects ranging from machinery to golf strokes.

Foliage Multiple exposure in daylight can be performed successfully if you use a motor drive. The number of exposures was pre-set on the drive so that the exposure could be worked out

With a rapidly moving subject, you need to make your 'exposures' very quickly with the minimum time between flashes. Although your ability to fire the gun quickly makes a difference, the real limiting factor is the time it takes the gun to recycle between flashes. Unfortunately, most small flash guns do not produce enough light nor do they recycle quickly enough to be used effectively with large or distant subjects—unless the movement is very slow. Nevertheless most automatic flashguns should recycle rapidly enough for small, close-up subjects. At close distances the flash emitted by such units is very brief, and thyristor circuitry enables them to recycle in less than a second. A few flashguns have manually variable power controls, and when used at their lowest setting with high speed film can allow multiple flash exposures to be made of a wider range of subjects.

This technique can be used with a variety of moving subjects, although it is probably best to try out your skill with human subjects first rather than machines. With human power, you can vary the speed of movement to suit the technique much more easily.

The procedure for this type of shot is

relatively straightforward. First set up your subject in a darkened room against a black background. Before turning the lights out, frame your subject so that all the important action occurs within the picture area. Rehearse the movement you are photographing a couple of times to ensure that it all falls within the frame and looks as you want it to. Set the camera's shutter to B, for a time exposure, and the aperture to the setting appropriate to the film speed as indicated on the calculator dial of your flash.

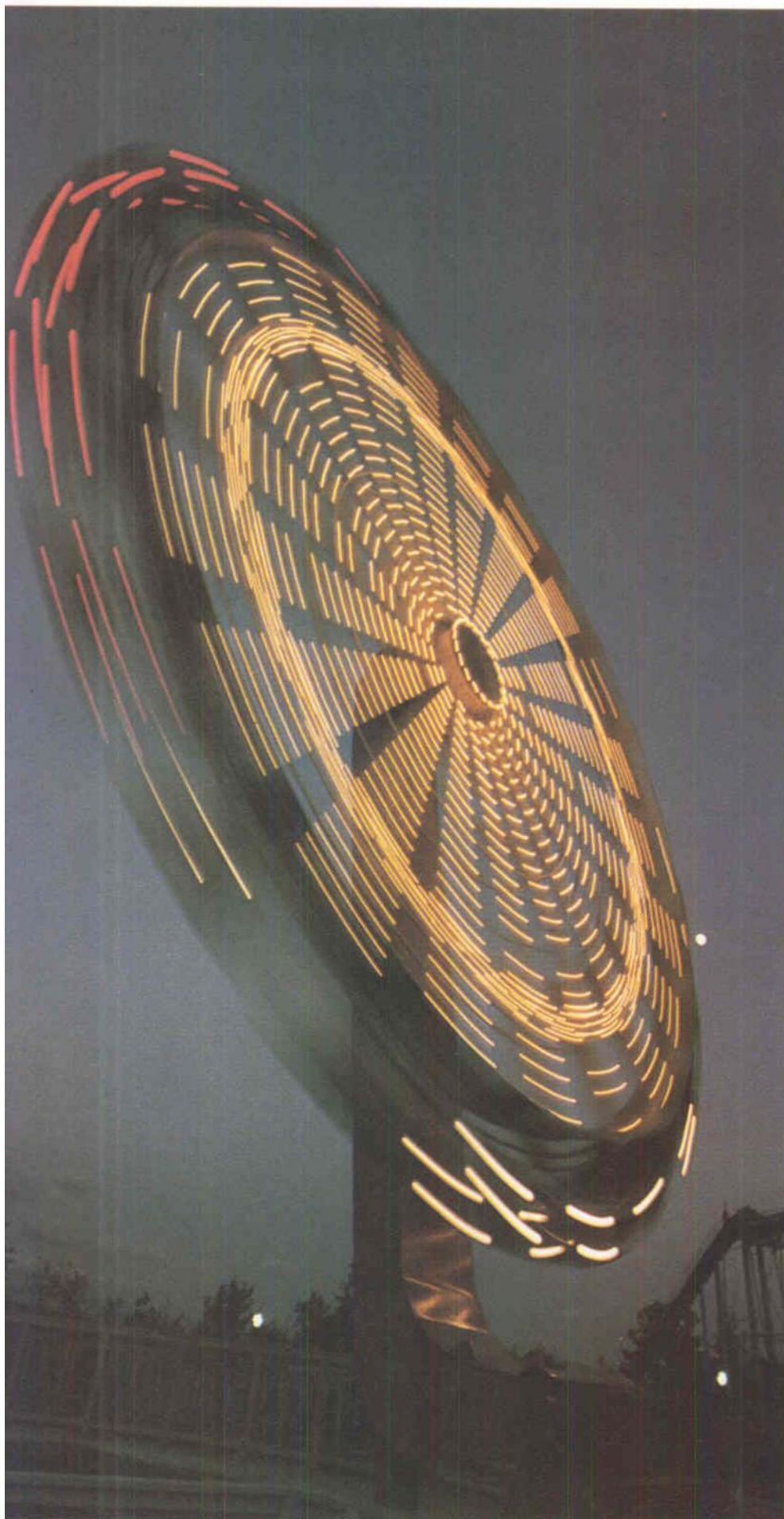
When everything is ready, turn out the lights, open the camera's shutter, start the action, and trigger the flash unit repeatedly until sufficient exposures have been made. Close the shutter when you have made enough flashes. To give your flash tube time to cool off, wait a minute or so before exposing another frame by the same technique.

Alternatives to flash

Although electronic flash is the most obvious source of light for this type of multiple exposure, you can use others. It is possible to light some subjects with a small stroboscope, of the type intended for use in discotheques, for instance. These recycle very quickly but have a

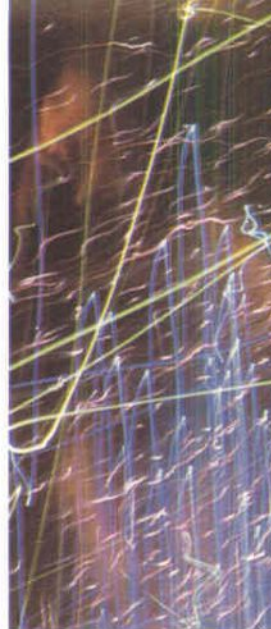


Ed Buziak



Big wheel Taken with a long exposure time, moving subjects like this brightly lit fairground ride make dazzling patterns. A steady tripod is essential for good results

Light streaks At night, city lights can make patterns like abstract paintings. Make a hand-held time exposure using tungsten balanced slide film for varied colour



very low power output. You must experiment to find the aperture that gives correct exposure. It is likely to be fairly wide open.

Another simple and often effective technique that can produce an effect similar to multiple flash exposure in normal daylight, is to use a rotating shutter in front of the lens. This is nothing more than a circle of black card with one or more sectors cut into it, mounted in such a way—with a nail through the centre, for instance—that it can be spun rapidly in front of the lens. A time exposure is made with the shutter spinning. Every time the open sector passes in front of the lens, exposure is made, so that as the shutter spins, a number of different exposures are made. Exposure is necessarily hit-and-miss with this method, and results lack the sharpness given by electronic flash.

Long exposure effects

Most normal photographs are made with exposures of a fraction of a second, but sometimes you can use very long exposures to create a particular effect. Moving objects will blur in the final image or can be made to disappear altogether. The camera must be mounted on a tripod to hold it steady and keep static parts of the picture sharp. Because long exposures let a great deal of light on to the film, you should use a slow film and a narrow aperture. If this still results in overexposure, you may need to use a neutral density filter to cut down the amount of light reaching the lens (see page 279).

With a long exposure you can reduce a waterfall to a blur, turn traffic at night into long streaks of light, or make a busy street appear completely empty since any moving object will not be recorded at all with a sufficiently long exposure. The range of potential subjects is very wide.

Long exposures will normally only produce a special effect if the scene contains some movement, but you may be able to inject movement into a static subject by moving the camera or lens during exposure. If you move the cam-

era it should be mounted on a sturdy tripod with a pan and tilt head. City lights at night, especially neon signs, are ideal subjects for panned or tilted long exposure effects.

It is often worth making half the exposure with the camera stationary so that the pattern of the lights is recognizable. Finding the best exposure for such subjects can be difficult and you should make a number of different exposures, remembering that with colour slide films it is best to aim towards underexposure so that the colours of the lights are rich and well saturated.

Rather than moving the camera, you can produce a different but equally interesting effect by changing the setting of the lens during a long exposure. Twisting the focusing ring to throw the image completely out of focus halfway

through the exposure gives a sharp image surrounded by a soft blur. A popular variation is to use a zoom lens and alter the focal length during exposure. This gives even static subjects an appearance of dynamic, exploding motion. If you use a slow film, you should be able to use sufficiently long exposures to complete the movement even in daylight—providing you move the zoom control quickly. Begin zooming at the same instant as you release the camera shutter. It does not matter if you change the focus setting slightly during zooming, since definition is not important in this type of picture.

It is possible to combine elements of multiple exposure and long exposure techniques to produce interesting results. For example, you can put a glowing outline around a subject photographed in a darkened room with no more equipment than a torch, a flash and a tripod. Arrange your subject in front of your camera, which should be mounted on as solid a tripod as possible. Set the shutter speed to B and fit a locking cable release. Plug your flash unit into the camera's PC socket, and carry out a last check to make sure that everything is ready, and that your torch is to hand.

When you release the shutter, the flash will fire, illuminating the subject. Hold the shutter open by locking the cable release, and move over to your subject—live subjects must be kept perfectly still for the next stage of the process. Switch on the torch and carefully trace around the outline of your subject in the dark, with the torch beam shining in the general direction of the camera lens. It is best if you wear dark clothing during this phase so that your image is not recorded on the film. When you have finished outlining the subject, close the camera shutter.



Sergio Dorantes

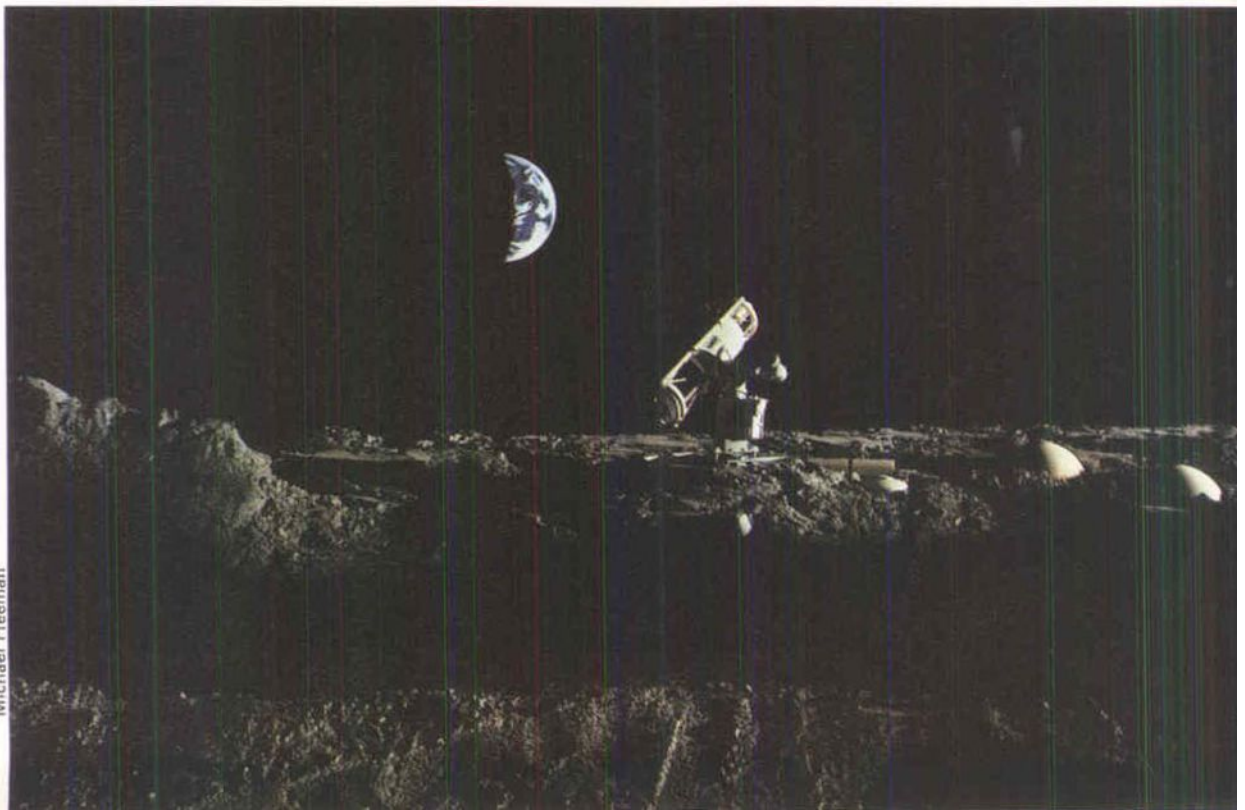


Wolf Winter/Explorer

Zoom Zoom effects can be created in daylight if you use slow colour film and a small aperture setting. A tripod is vital to produce fully controlled effects, without disturbing up and down or side to side vibrations

Moonscape Tiny set built in a studio, using high alumina cement for the Moon surface and parts from plastic model kits for the Moonbase. To give a greater illusion of luminosity, the Earth and stars were added in two exposures

Michael Freeman



Processing colour negatives

One of the main attractions of processing your own negatives is that you see the results quickly and, therefore, can quickly move on to producing quality, hand-made colour enlargements

To the uninitiated, colour processing and printing seem discouragingly complex, but if you can handle black and white confidently there is no reason why you should not be able to tackle colour processing with equal success. Although they require a little more care than black and white, modern colour processes are quite straightforward.

In this article, the first of a series dealing with basic colour processing and printing, basic colour negative processing techniques are explained. Special care must be taken over every aspect of colour processing and before you

undertake any colour work you must bear the following points in mind.

- Temperatures of the various process solutions must be accurately maintained at much higher levels than generally encountered in black and white processing. Special temperature control techniques are needed to keep solution temperatures at constant levels. The maximum allowable variation with some processes is measured in fractions of a degree.

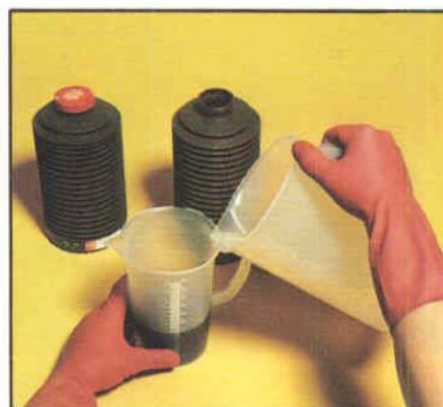
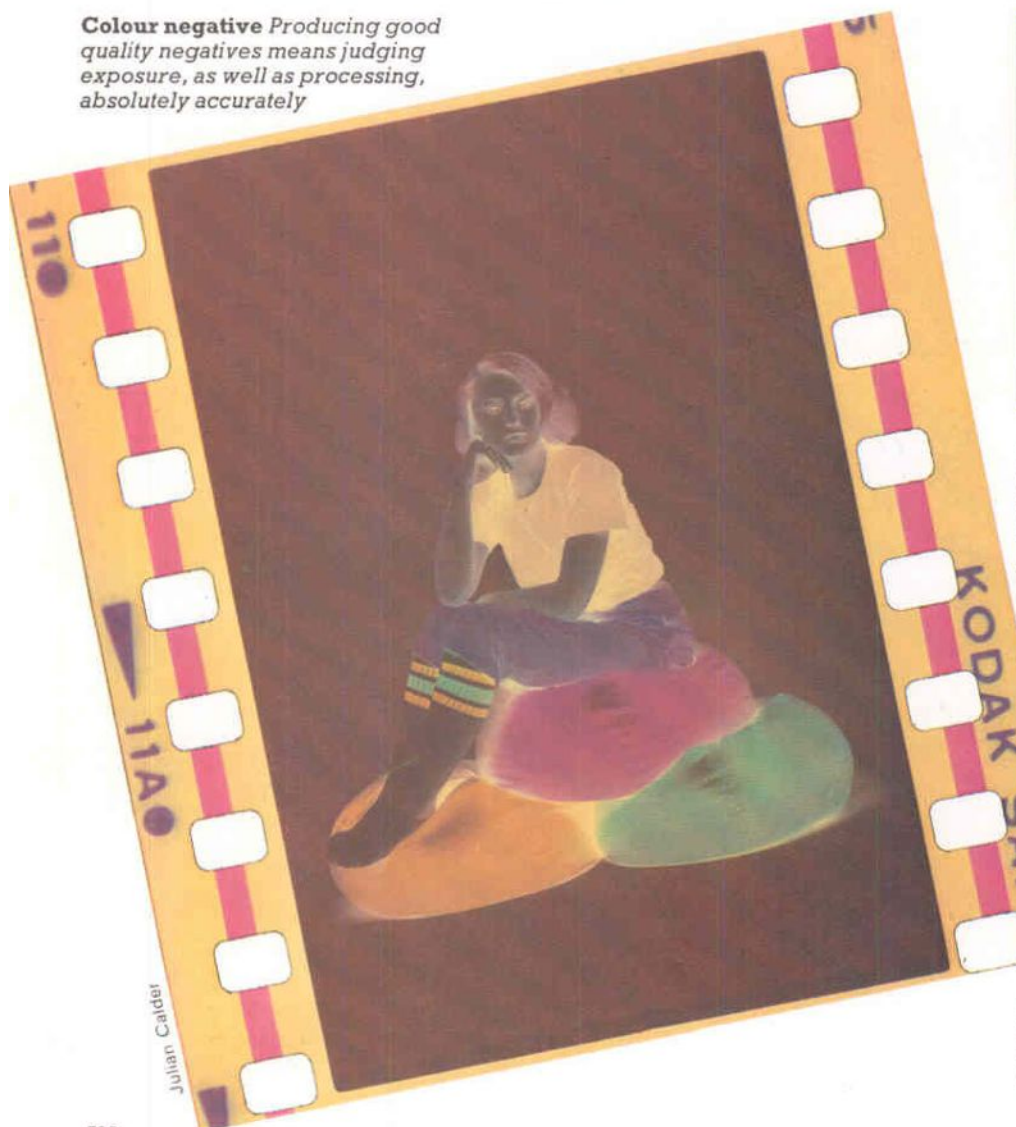
- Some processes involve many individual processing steps and are lengthy, especially the low process temperature methods.

- Some of the chemicals used in colour processing are extremely harmful and very great care must be taken in their preparation, use and disposal.

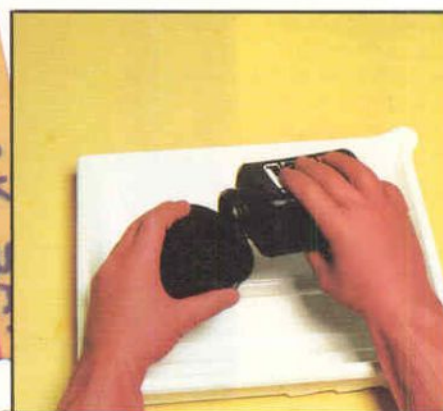
- Colour process solutions are generally more expensive than those used for black and white processing. They do not keep well once prepared and they should be stored carefully.

In black and white processing, one developer can be used to process different makes and types of film. In colour work, it is usual for a particular type of film to be tied to a particular process, although in some cases it may

Colour negative Producing good quality negatives means judging exposure, as well as processing, absolutely accurately



1 Prepare processing solutions using the specific instructions supplied by the maker. Photocolor II developer is mixed 1 + 2 with water, bleach-fix 1 + 1



4 Check that the solution temperature is 38°C, discard the preheat water, then quickly pour in the developer. Note the precise time development begins

be possible to use one set of chemicals for processing most of your colour negative films and prints.

Extra equipment

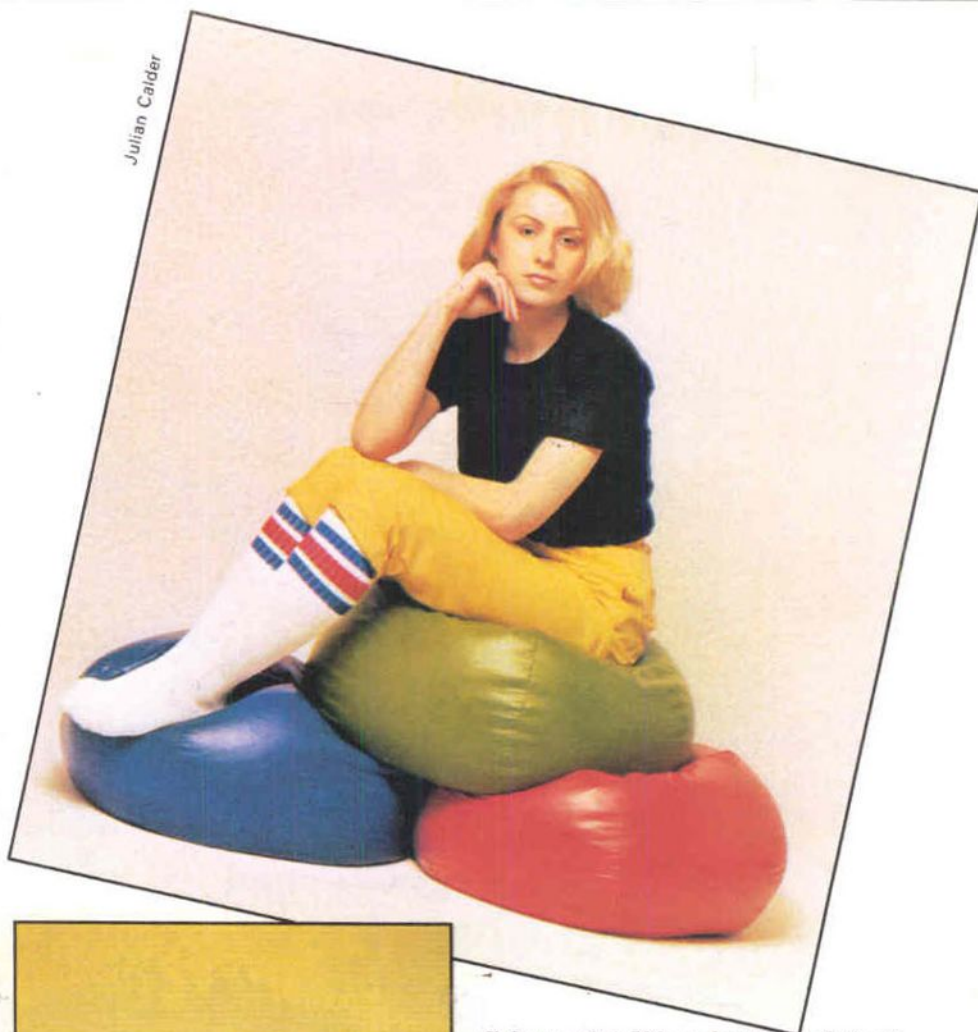
Very little additional equipment is necessary if you are already equipped for b & w processing and decide, for economy, to use these items for colour film processing. However, to eliminate any risk of cross contamination, it is worth buying separate equipment for colour work if possible.

For advice on buying equipment see page 490, but a few points are worth bearing in mind when selecting equipment for colour work. First of all, a spirit thermometer is not sufficiently accurate and you should buy a mercury-filled type. Choose a thermometer with a comparatively short range so that temperature changes are clearly visible.

Secondly, it may well be worth buying a dishwarmer although they are very expensive. A dishwarmer ensures that the high colour processing temperatures are properly maintained.

Although a dishwarmer is not essential, it makes temperature control much simpler. Of course, the dishwarmer may be used for any form of processing—it would be particularly useful if ever you

Julian Calder



Colour print Although you can do (and undo) a lot during colour printing, a quality print is best made from a good quality negative

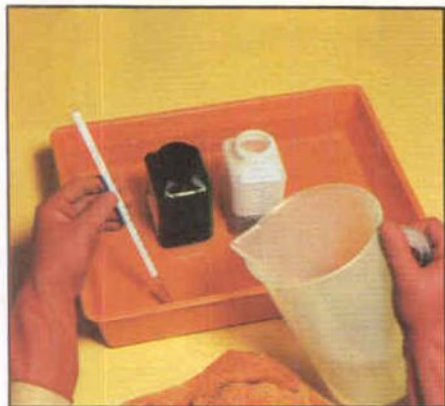
want to dish process colour prints.

Alternatively, you may wish to buy one of the various types of processing machine designed for the amateur. These *tempering units* (designed to maintain temperatures) incorporate solution heating compartments warmed by an enclosed jacket of warmed water or air. More elaborate machines accept processing drums for both negatives and prints, and usually incorporate a rocker and roller mechanism to provide continuous agitation. Although both the tempering units and the more elaborate machines use the simple principle of a water bath, the added convenience of thermostatic temperature control combined with all the benefits of an enclosed jacket of water ensures a much higher standard of processing consistency.

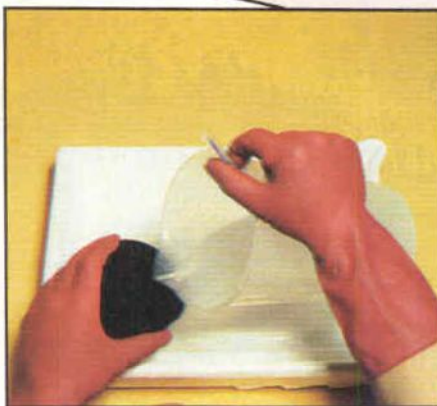
Processing

Colour negative processing consists of two or three main stages: development and a bleach-fix; or a separate bleach and fix.

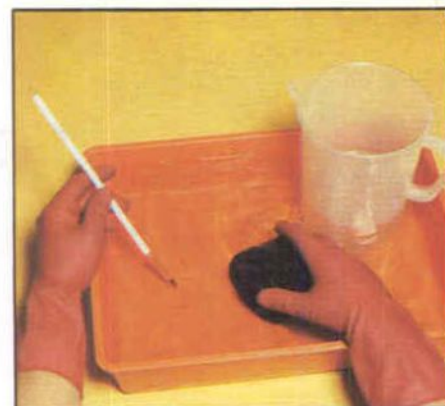
Colour negative film is coated with three emulsion layers, each sensitive to one particular colour. During development, silver is produced in all three layers to produce a negative with dense highlights and light shadow areas just like a black and white negative. However, during development dye images



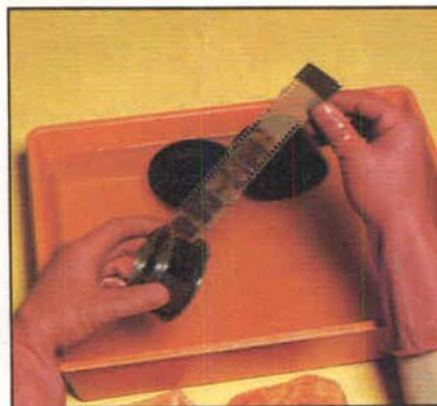
2 Measure off a quantity of each solution and stand the containers in a waterbath until the contents reach 38°C. Keep the bath topped up with hot water



3 While the solutions are warming up, load the tank in darkness. Preheat the tank and film using clean water heated to 40°C



5 Continue through stop-bath and bleach-fix stages according to the maker's instructions before using the waterbath water for rinsing the film



6 Continue using separate rinses or, better still, running water at the right temperature until washing is complete—only then remove the film for drying

Jon Bouchier

are also formed in each of the three layers to form the colour component of the image. The dye image of each layer corresponds exactly to the amount of silver in that layer, and heavier dye deposits are formed in areas which have received more exposure.

Because the variations in dye strength show all the colour and density variations, the metallic silver of each layer serves no useful purpose beyond this stage and is therefore removed after development by a *bleach bath*. The third stage is a *fixing bath* to stabilize the image. In most modern processes these bleach and fix baths are combined to form what is known as a *bleach-fix*. Finally, the film is washed to remove the waste products and residue process chemicals.

Details vary from process to process, and there is no typical method, but one of the simplest and most widely available is the Photocolor II process and this is explained in detail. Other processes are outlined in the panel.

Photocolor II process

The Photocolor II process can be used for Kodacolor II type films instead of Kodak's own process C-41 but cannot be used for Agfacolor. For the amateur, the Photocolor II kit is especially attractive because it may also be used for processing colour prints.

Start off the processing sequence by preparing the process solutions. The Photocolor II colour developer concentrate is diluted with two parts of ordinary tap water. Calculate the capacity of your developing tank and divide this by three in order to determine just how much concentrate is required. You need about 100 ml for a typical 35 mm tank. If you have to use the same measuring cylinder, always mix up the developer before the bleach-fix is diluted, but to avoid contamination it is better to have separate plastic measures for each solution.

The bleach-fix concentrate is diluted 1 + 1 with tap water. Do not use stainless steel containers for holding or storing this chemical because it can be corrosive. If you do use stainless steel containers for mixing, wash them immediately after use.

Try to keep splashes to a minimum when mixing up these chemicals, and keep them well away from food and food preparation surfaces. Rinse down any splashes with plenty of water or stains may remain afterwards. Always wear gloves when preparing and using colour process solutions.

Pour the working strength solutions into the waterbath containers and bring the temperature of the solutions up to the selected process temperature, which is normally 38°C for the Photocolor II process.

While the chemicals are being warmed up, load your developing tank in complete darkness. But you must make sure that your hands are free of traces of chemical concentrate, other-

wise fingerprints and smears may show on the processed film.

The tank, with film loaded, can be placed along with the solution containers in the water bath so that the tank and its contents are warmed up to the correct process temperature.

If, however, you can independently raise the temperatures of the solutions to the required level and decide not to use a water bath, you can use a pre-heat (or pre-soak) water bath of 40°C water to take the chill off the tank and its contents. This bath must be completely free of any contaminants. Drain this pre-heat bath completely after one minute.

Pour in the developer, agitating continuously for the first half-minute. As soon as the first period of agitation is complete, quickly measure the temperature of the developer within the tank if your tank has a facility for inserting a thermometer. Otherwise you must take extreme care to keep the tank in a water bath at the correct temperature.

If the developer temperature has fallen below 38°C, consult the temperature correction diagram supplied in the instructions, and obtain the new process time. For example, if the temperature of the developer drops immediately to 35°C when loaded into a tank that has not been properly warmed, development time should be increased by 35 seconds.

Agitate the film four times each minute by inverting the tank twice. For negatives of consistent quality and to simplify the printing of different films, take care to standardize processing procedures, times and temperatures as much as possible.

You should start to drain off the developer a little before the developing time is up because development will continue as the tank is draining. This is especially important in slow draining plastic tanks. It is worth working out how long your tank takes to empty and allowing for this. In the Photocolor II process, developer can be re-used, so store it

Colour negative processes

Different types of processing kits can be used to process your colour negative film, and the times for four of them are shown here. For convenience, use a short-cycle process if one is available for your film type



Agfa process N

This kit is for processing CNS and CNS2 Agfacolor negative film. It is packaged in powder form to make four solutions. Also shown is the Process F kit for C-41 film which is packed in liquid form

About the processes:

Processing stages:

	Temperature	Time (mins.)	Process notes
Preheat bath		—	
Colour developer	20±0.2°C	8	1
Intermediate bath	20±0.5°C	4	2
Wash	14—20°C	14	3
Rinse/Stop-bath		—	
Bleach	20±0.5°C	6	2
Bleach-fix		—	
Wash	14—20°C	6	
Fixer	18—20°C	6	2
Wash	14—20°C	10	
Stabilizer		—	
Dry	to 45°C	10—20	

Process notes:

1 Exact time depends on agitation method used and may need to be adjusted for your purposes. **2** Time not critical. **3** Time may be extended but not shortened. The working capacity per litre (without replenishment) of each solution is six 36-exposure films. The solutions are prepared from powder by diluting with water at about 20°C

carefully. Capacity depends upon circumstances, but 300 ml of developer can be used for processing three 36-exposure films—though you must process the other two within about a week of the first. Keep your stored bottles of developer completely full so that the solution does not go 'off'.

As soon as the developer has been poured out, rinse the tank with three 15 second washes using water at between 35 and 40°C. Providing it is clean, this water can be obtained from the water bath. Failing this, warm up some fresh water to the correct temperature.

An acid stop bath can be used instead of the water rinse, and this ensures that development is stopped instantly. If you use an acid bath, this should last 30 seconds, with continuous agitation.

The bleach-fix bath follows immediately. The bleach-fix solution should, like the developer, be kept precisely at 38°C. Agitate the tank continuously for the first minute and then

every 15 seconds until the 3 minutes in this bath are up.

Once the bleach-fix process ends, remove the film spiral from the tank, and be careful not to splash bleach-fix. But before you pour the bleach-fix out of the tank, check that the negative image has bleached completely and evenly. If not the bleach-fix has not worked properly—possibly because you have allowed the temperature of the bath to drop below the minimum of 38°C.

To be safe always make a point of using fresh or almost fresh developer or bleach solution for negative processing. Save part-used solution for colour print processing.

Film washing times depend on the temperature of the wash water. Avoid a sudden drop to start with, and do not let it drop lower than 20°C. Use water from the water bath for the first few rinses and gradually introduce cooler running water into a tank full of this warmer water. Wash times range

from 5 minutes at 35°C, to at least 15 minutes at 20°C. Afterwards, hang the film to dry in a suitable dust-free location.

Do not be unduly worried about the milky appearance of the emulsion when wet. This disappears as the film dries.

The key to success with colour negative film processing is consistency. You must always take great care to make sure that your procedure is identical every time you process a film—use fresh, accurately measured solutions, meticulously check temperatures and always agitate in an identical manner. Only change your technique if results are unsatisfactory.

Nevertheless, if you find yourself unable to guarantee consistent results with colour negative film processing, do not be put off colour in the darkroom altogether. Have your films processed commercially and concentrate on colour printing where mistakes only mean the waste of material, not the loss of your valuable, original photographs.

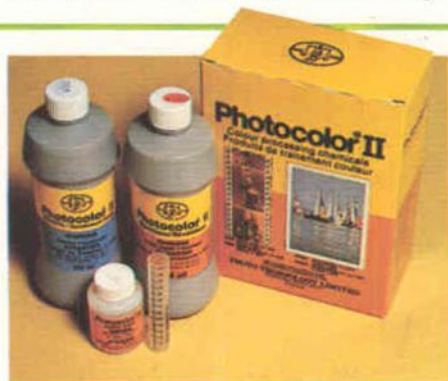


Kodak Flexicolor

This kit is for processing Kodacolor-II type negatives (Process C-41). It has a three-part liquid concentrate developer, three-part liquid and powder bleach, and a bottle each of fixer and stabilizer

Temperature	Time (mins.)	Process notes
37.8±0.2°C	3½	1, 2, 3
24—40°C	6½	4
24—40°C	3½	
24—40°C	6½	
24—40°C	3½	
24—40°C	1½	
to 45°C	10—20	

1 Time as with all colour processes is critical 2 Use a waterbath at 38°C. 3 Agitate vigorously for first 30 seconds (by 30 complete inversions), place the tank in the waterbath for 13 seconds and then give two inversions, repeating this until 10 seconds before end of development. 4 Agitate for 5 seconds every 30 after initial 30 second agitation



Photocolor II

A very easy to use kit for Kodacolor II type negatives and Kodak or Agfa types of printing paper. Liquid concentrate developer and bleach-fix are diluted just prior to use

Temperature	Time (mins.)	Process notes
40°C	1	1
38°C	2½	2, 3, 4
35—40°C	½	
35—40°C	3	5
20—30°C	5—15	6
to 45°C	10—20	

1 The water used for the preheat bath must be completely clean. 2 Continuous agitation first 20 sec, then two inversions four times per minute. 3 Times can be adjusted according to initial temperature drop. 4 Solution may be stored for re-use. 5 Six inversions first minute, then as dev. 6 Minimum times with running water, longer for individual rinses.



Unicolor K2

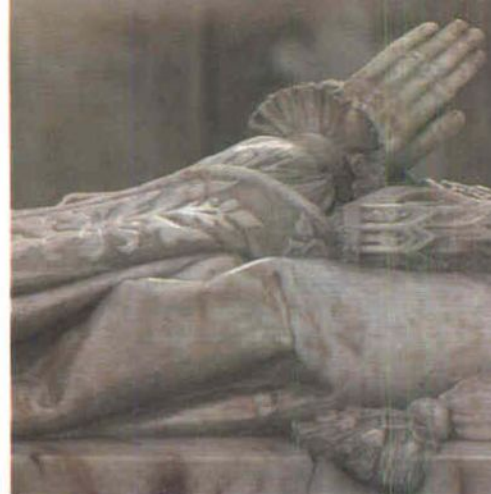
For all C-41 process films. Kit consists of a three-part developer and fixer, and a stabilizer. With careful measuring these liquid concentrates can be used to make up small quantities of solution

Temperature	Time (mins.)	Process notes
38°C	1	1
38°C	3½	2
35—41°C	6—7	3, 4
35—41°C	3—4	3, 5
20°C	½—1	
to 45°C	10—20	

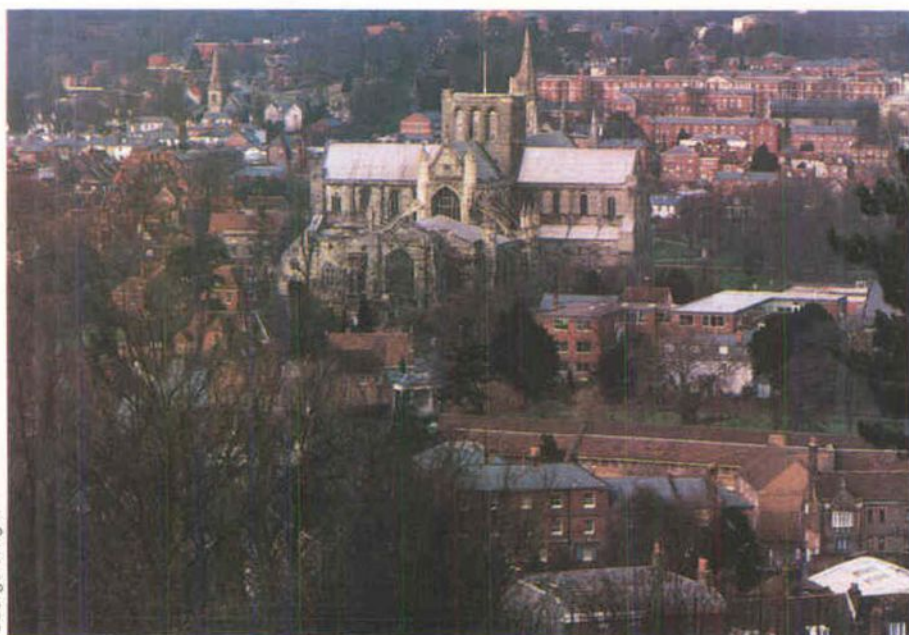
1 Water must be clean. 2 Solutions may be re-used. Only developer requires additional time (+15 sec for second film, +30 sec for third film). 3 Time not critical beyond minimum. 4 Steps after bleach-fix may be carried out in normal lighting with tank lid off. 5 Use water flow sufficient to change water in film tank at least six times

Winchester Cathedral

The mighty edifice of a cathedral presents a great photographic challenge—majestic architecture, ornate detail and living reminders of ages past



George Wright



When George Wright visited Winchester Cathedral for this assignment, he knew he had to give some very careful thought to the way he approached the subject if he was to come away with anything more than an ordinary 'picture-postcard' record.

As initial preparation, George obtained prior permission to use a tripod to cope with the low light levels inside. He also bought a detailed map of the surrounding area to help him work out the best vantage points beforehand.

Arriving early to take advantage of the dawn light, George began by photographing the cathedral from a distance. He described his approach:

'There are so many problems with photographing a building at close range that I decided to get further away and try for a shot which showed the Cathedral in relation to the city—as a focal point of the community.'

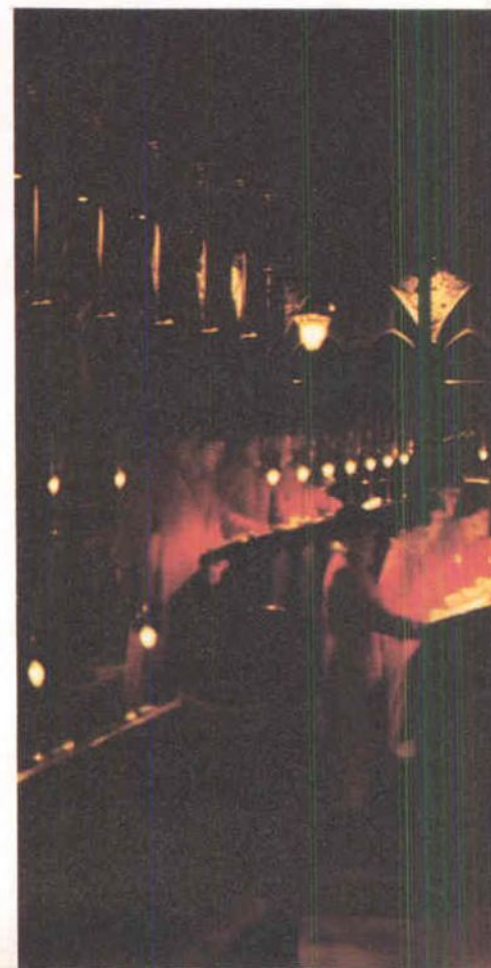
To do this, George tried shots from three or four different vantage points which he had established by using the map. At each one he tried viewing the scene with 105 mm, 300 mm and 500 mm lenses. For some shots he fitted a 10M filter to add a subtle pink hue to the stonework and to prevent the exterior appearing as a drab grey due to the overcast sky. Unfortunately he was unlucky with the weather and the dawn



light did not produce the more dramatic and colourful effects he had hoped for.

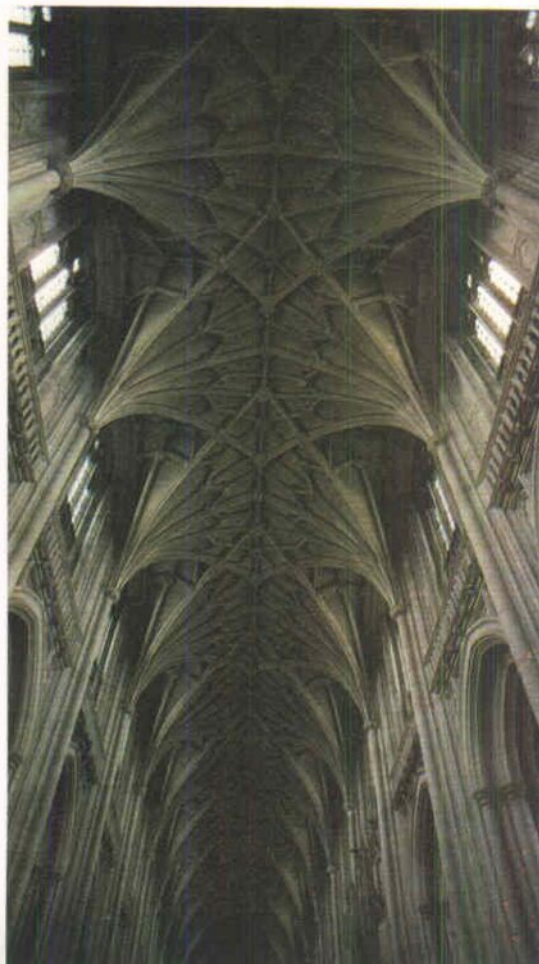
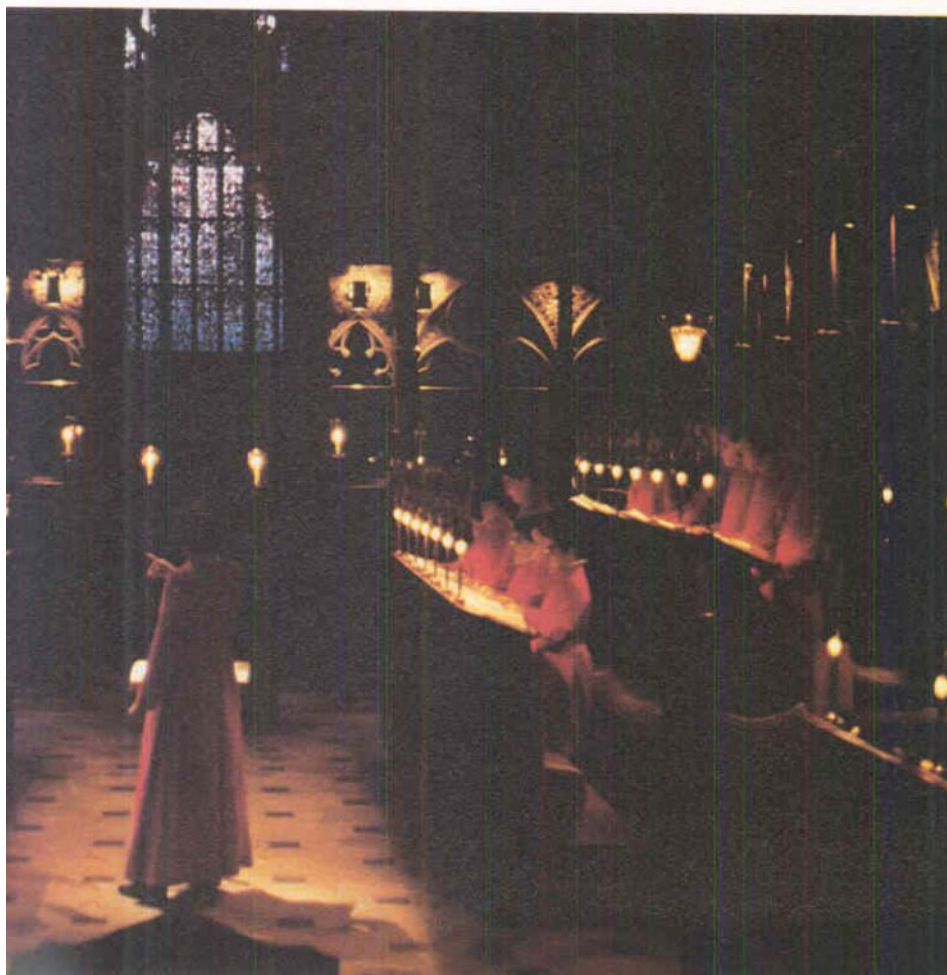
Moving inside, George began by devoting attention to some of the small details which, to him, conveyed the strong sense of history: the brass epitaph of Jane Austen; the carved pews; the images in the stained glass windows.

The light level was so low that a flashgun was needed for most of these shots. For the stained glass windows, George bracketed his exposures carefully, but the diffused light of the overcast day was just right for giving even backlighting. Light coming through the stained glass also had a green cast so, for the interior shots taken without flash,





Tomb sculpture Places of worship are often full of attractive details. Like many of these shots, George worked on presenting this profile in a creative way. **Brass epitaph** this shot helps convey part of the cathedral's history. Its polished surface contrasts with other softer-textured shots. **Choristers' gowns** These brightly coloured robes caught George's eye as he looked around for new subjects. Careful framing and vivid colours make it an attractive composition. **Stained glass window** George bracketed his exposures for this—clearer windows can 'fool' the camera's meter into underexposing. **Choir practice** Ektachrome 400, uprated to 3200ASA produced this pleasing grainy effect. **Looking up** There may be as much interest overhead as there is at ground level inside a cathedral. George used as 28 mm lens to include as much detail as possible

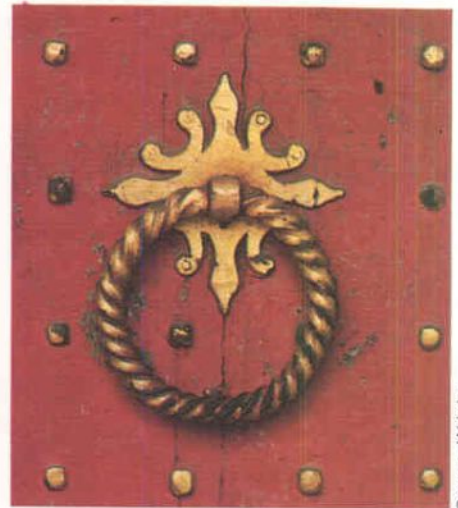
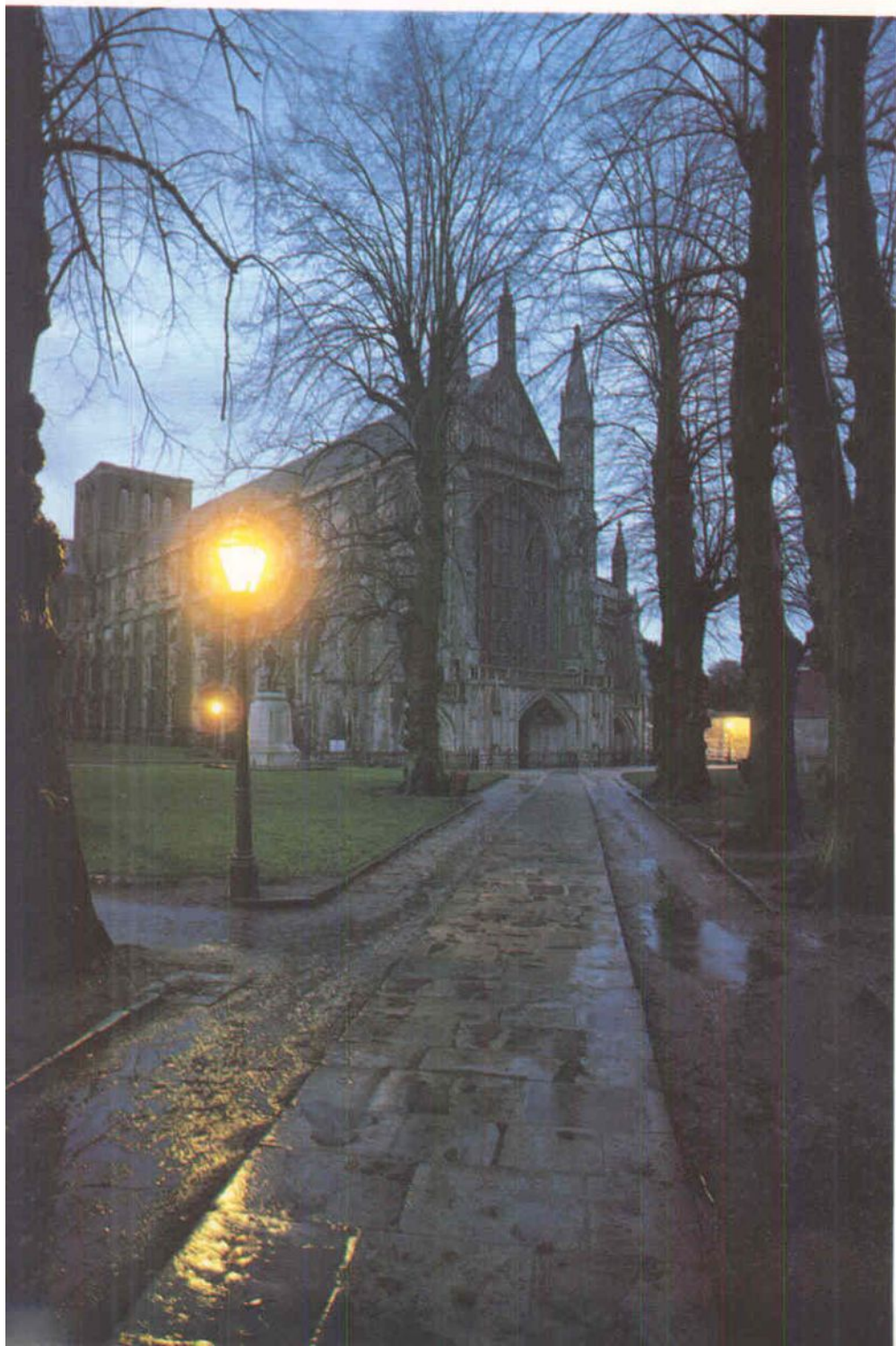




Group portrait Photographs like this can only be taken with the full cooperation of the choir master. Two large flash heads were used for illumination

Twilight Just before nightfall is an excellent time for capturing mood and atmosphere as this shot of the cathedral surroundings shows

Door knocker Small details convey a sense of place just as much as wide views. George was intrigued by this subject's shape and texture



George Wright

George used a 10M compensating filter, magenta being complementary to green.

Towards the end of the day George had taken a variety of photographs and, to round off the assignment, finished with a shot of the cathedral in evening light. For this he set up the tripod outside and carefully framed the shot to include a street lamp, a wet pavement and the cathedral in the background—introducing a strong atmosphere in the shot. He had to draw on experience to ensure that the tungsten light did not dominate the scene, and to prevent the branches of the tree blurring as they moved in the wind. Choosing a moment when the wind had dropped, George opened up his 28 mm lens to $f/3.5$ and used a shutter speed of two seconds.



Patrick Lichfield

World famous for his portraits and fashion photography, Patrick Lichfield also takes a wide variety of advertising and editorial photographs in locations as far apart as Bermuda and Birmingham

Hanging on the walls of a room above Patrick Lichfield's London studio there are a number of frames containing Polaroid prints of his favourite pictures. Each frame represents a year's work and a glance at the collection gives some impressions of the tremendous range of Lichfield's photography and the variety of people he has worked with.

'It's absolutely impossible to recall all the jobs I have done, but by looking at the boards I can see them instantly. There is, for example, a fashion set-up in Fiji, editorial work for Australian *Cosmo* and *The Sunday Times*, my first Burberry work, Brazilia, a portrait of Princess Anne, some commercial stuff for Johnson's Baby Powder, Lux with Jane Seymour, Niven, Sharif, Caine, Melly, Cooper... the range is endless.'

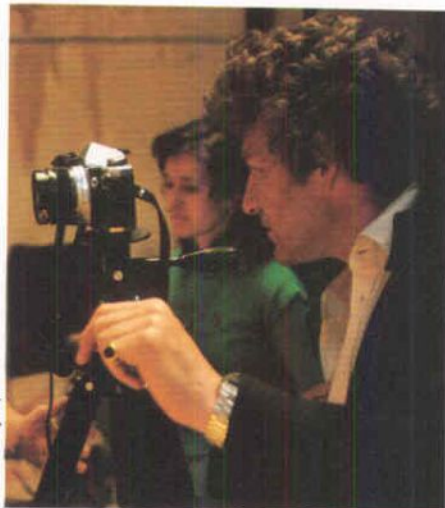
Although about 90 per cent of Lichfield's work is now commercial—advertising, for instance—he still likes editorial work because he appreciates variety in his photography. 'I know one or two photographers who do nothing but pack shots and still lifes—that would drive me mad!'

Ideas for editorial work—for magazines and books—now tend to come from Lichfield himself rather than the clients. 'If I have an idea that I want to do rather badly, I'll phone up a magazine and suggest it to them. For example, we've just finished doing a rather funny series of pictures. I rang up a number of well known people and asked them who they would like to be if they weren't themselves. It worked well—they all took it as seriously as I hoped they would. Clement Freud wanted to be Gladstone, so we dressed him up and took him to the Reform Club. Ronnie Corbett wanted to be the head chef at the Dorchester. He was marvellous and chopped his mushrooms beautifully.'

Unfortunately, editorial work is rarely well paid and he cannot usually do quite as much as he would like. For Lichfield, the ideal combination would be to divide his time so that he spends about 40 per cent each on commercial and editorial work and 20 per cent for his own personal pictures. 'Commercial photography is extremely good for you because it's very demanding—sometimes the brief you are given seems technically impossible!'

Nevertheless, concentrating on commercial work does not necessarily mean

Trail biker Taken on a Kenyan game reserve for the annual glamour calendar of a spare part manufacturer



John Whyte/BAT

losing complete creative freedom. Once, when shooting a calendar, for instance, his brief from Kodak was simply to 'go and do Harrow'. 'At first I wasn't very keen on the idea, but then I began to see it as something of a challenge. Making a whole calendar out of Harrow was actually incredibly difficult, but I had plenty of time to go back occasionally and get extra shots.'

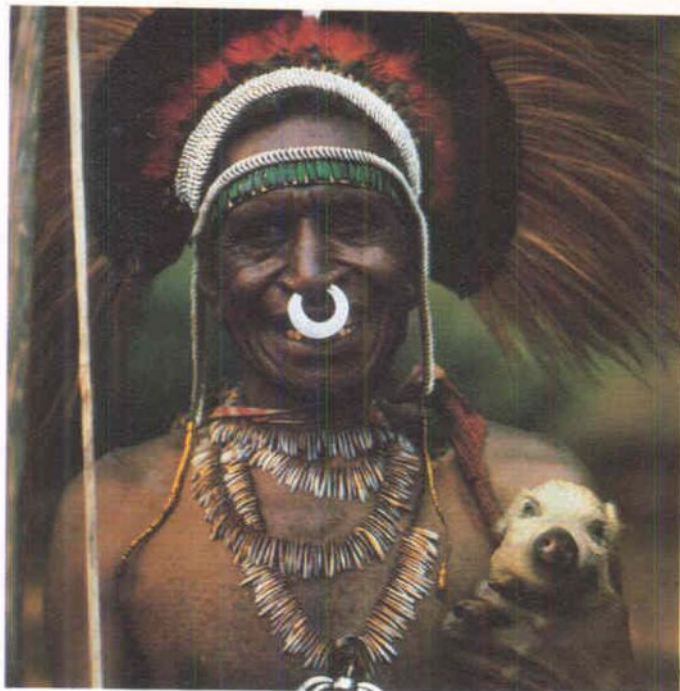
Lichfield has also done a number of award-winning glamour calendars. Once again, he was given considerable editorial freedom. As calendars are generally prestige items, a great deal of initial planning goes into them. Lichfield

On location Lichfield, with researcher Lynda Berry, shooting on location at a steel foundry in Aberdeen



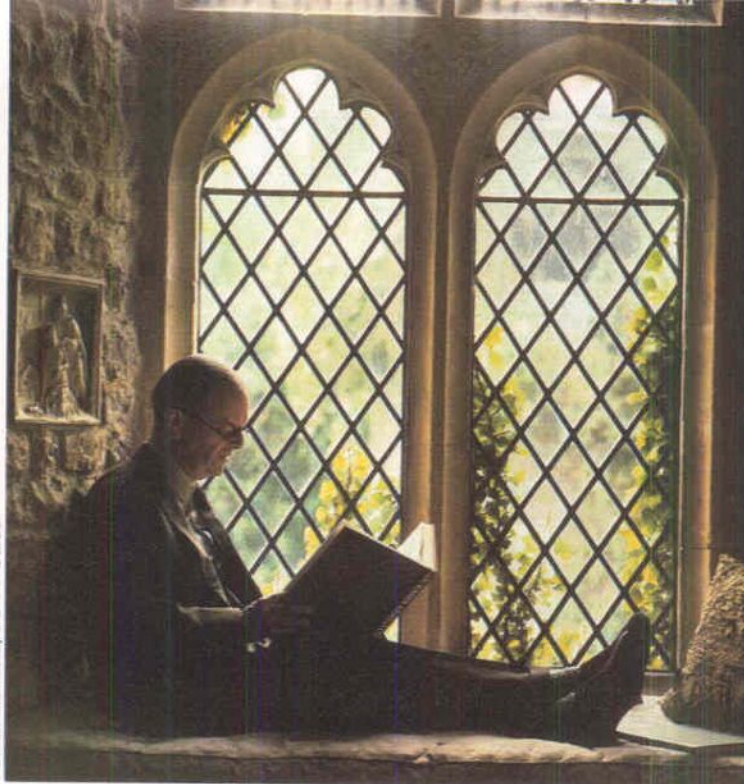
Patrick Lichfield/Unipart





Patrick Lichfield/US TV Guide

Tribesmen in Papua New Guinea A personal picture taken in Goroka during a rare break from a commercial assignment



Lord Kenneth Clark An intimate portrait that reveals his subject's involvement with art and culture

believes that a number of factors contribute to a successful series of calendar shots. 'First of all, you must have very good models. You must also plan the shoot carefully in advance. And, thirdly, the end photographs should be moderately titillating but not too overtly sexy or offensive.'

The photographer and the client's art director generally think of a theme to link all the photographs and give the calendar a distinctive 'look'. For one calendar, the theme was along the lines of 'Gone with the Wind' and 'Huckleberry Finn' and he shot all the pictures in the deep south of the United States. Another year they hired a chateau in France and more recently they were on safari in Kenya.

Once the theme has been decided Lichfield and the art director get together with the stylist and work out the clothes that the models will wear. Even if the clothing is minimal, it must be right.

With the style of the clothes decided, Lichfield and the art director then start to discuss ideas for individual photographs, working from roughs drawn up by the art director. 'Both the art director and myself work on the ideas together and normally we'll fight like hell over them. The best pictures often come out of a slightly tense relationship.'

Assignments like this need a large team—not only several models but also a complete back up team of stylists and designers. Careful preparation and plan-

ning is absolutely vital, particularly for exotic foreign locations where time and expense are at a premium.

For the amount of preparation and planning needed for all his work, Patrick Lichfield employs a full-time staff of two assistants, a driver and a secretary at his London studio. He values them highly as it makes a great difference to him to be able to rely on assistants who know exactly how he works.

When travelling on such an assignment Lichfield may take two complete sets of equipment with him. For large format work, his standard set is built around two Hasselblad cameras which he also uses for studio work. He has two

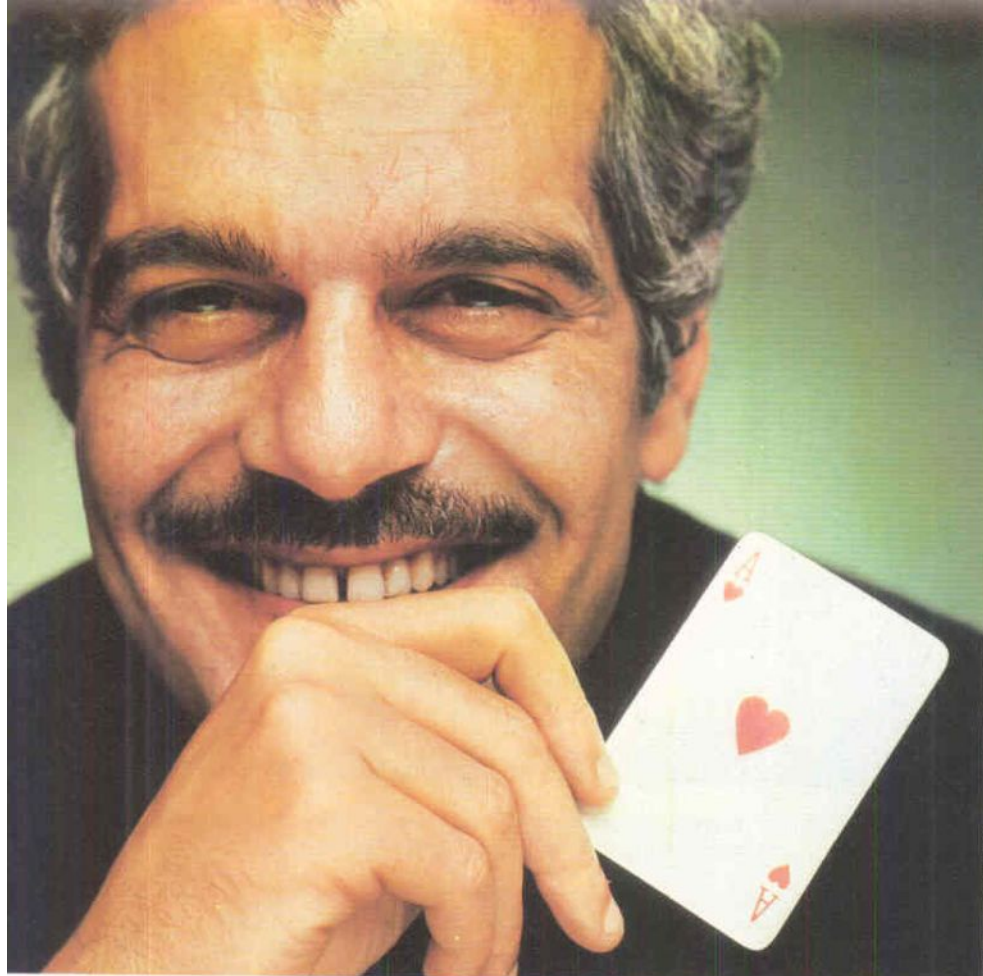
camera bodies, four magazines and four lenses—the 40, 80, 150 and 350 mm lenses. He also has a Polaroid back. He considers Polaroid the most important invention in photography since the war, because it provides the photographer with an instant check on the effect of a particular shot and shows up any mistakes before serious shooting begins. It has sometimes saved him from expensive disasters by revealing faults in equipment.

When he does not need a large format, Lichfield prefers to use his Olympus cameras. He takes four camera bodies with autowinders and a variety of different lenses from 24 mm to 600 mm to

Bathtime Using a specially made light box and flash, Lichfield took this shot in his studio for another calendar

Highland jig An informal 24th birthday portrait of Prince Charles dancing with Lady Sarah Armstrong-Jones





Patrick Lichfield/Cosmopolitan Magazine

suit the assignment. He dislikes the standard 50 mm lens and very wide angle lenses, and if limited in his choice he would normally pick a versatile 75-150 mm zoom lens. Lichfield also enjoys using filters but prefers to use them very selectively. 'I aim to use them without people knowing. I hate it when people overdo it, but I do use corrective filters. We test our films whenever possible and if I don't quite like the colour I change it—I don't like blue skin, so I tend to use warm filters.'

All professional photographers are very concerned about accurate colour rendition and go to considerable lengths to ensure that each film gives good results. Lichfield is no exception. With Ektachrome film, for instance, he will always do a 'clip test'. This simply involves exposing a few frames clipped off the beginning of the film and examining the developed results. He can then see what adjustments need to be made to ensure good colour.

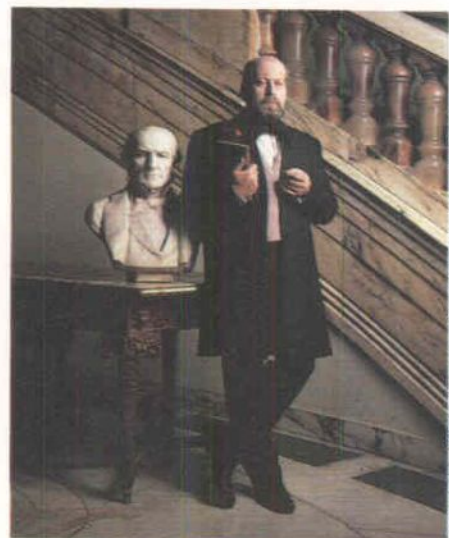
Unfortunately, this sort of test cannot be done with Kodachrome 25 and even though it gives superb colour, Lichfield does not use it quite as much as he would like. It is also a relatively slow film and requires a tripod which he finds an encumbrance for studio portraits. So although he loads the Olympus with Kodachrome 25 when on location, he frequently uses Ektachrome Professional film in the studio.

Clement Freud The British MP posing as Gladstone in the Liberal Club. Lit by flash bounced off a white umbrella

Omar Sharif Even studio portraits can be given an extra dimension. Sharif is famous as a bridge player

Although the proportion of black and white in Lichfield's work has dropped considerably over the years, he would prefer to be using more black and white. 'I take my own snaps in black and white, together with most of the private portraits that I do.'

Lichfield is justly famous for his pictures of people, both famous and ordinary, and he owes some of his success to his easy and unselfconscious charm. Like many other good 'people photographers' he excels at putting people at their ease and helping them to relax.



Patrick Lichfield/Woman/Syndication International

He likes to portray people at their best. When photographing women, for example, he prefers to shoot down on them slightly so the face appears heart shaped. 'When I'm doing beauty or head shots in the studio, I don't use a tripod much. I like to be able to leap up and down so I can photograph people from several different angles.'

This kind of agility once helped him on a rather formal occasion when he was photographing the Duke and Duchess of Windsor. 'I was standing on a chair and trying to get some good shots, but they just weren't reacting. Then all of a sudden I went right through it and was hobbled by it. They wouldn't stop laughing then and I got the shots I wanted. It was their chair too!'

Although Lichfield excels at portraiture this is still only a small proportion of his work. Most of his location photography is fashion, which makes up about half of his commercial assignments. Besides work for *Harper's* and *Vogue* in Britain, he also works for magazines based in other countries such as Italy, the United States and Australia, and for a variety of companies and advertising agencies doing fashion advertisements.

Perhaps the most famous of his fashion assignments are the series of fashion advertisements that he did for Burberrys. As makers of classic British raincoats, the emphasis was on the Britishness of their image. Most of the advertisements themselves were straight, 'classic' shots, but again Lichfield was able to exercise some editorial freedom.

'I managed to persuade them to produce some landscapes. The pictures were really panoramas of England with tiny little figures in Burberry raincoats. Everyone knows what Burberrys look like—so I just made sure they looked recognizable or at least featured the Burberry rugs with their distinctive check. The subjects were just diminutive figures—but photographically they worked wonderfully well.'

With his aristocratic background and his fame, Lichfield is often asked to do advertising work partly so that the client can use his name. He does not resent this but he much prefers it when he is asked to do a job in which his name does not appear—it proves that he is being used as a photographer.

'Some of the best pictures I've taken have never had my name underneath them. There's a theory that it is nice to have photographer's by-lines on advertising pictures but I think it's a good thing not to.'

Although his aristocratic background is now one of his hallmarks, it proved to be of little help when he started out. In the 60s, photography had none of the glamour it has now and his family were unsupportive when he made it known he wanted to be a photographer. They disinherited him and told him that he must make it on his own.

He began his career as an assistant to an advertising photographer, earning a pittance and, for the first three years, life



Cheetahs The film was underexposed to achieve greater colour saturation. Taken for a limited edition of prints

was far from easy. His prospects started to improve when he set up on his own, but his biggest break was landing a contract with American *Vogue* magazine.

'That was magic. There was a wonderful editor called Mrs Vreeland who was a goddess. Everybody wanted to work for her because she had such a marvellous reputation. I had an interview with her in Paris and she asked me who was the best dressed man in the world. I said 'Me,' and she replied that she liked my confidence but wanted the truth. I said I believed that it was the Duke of Windsor. She said, 'Go and photograph him and meet me here tomorrow evening at 6 o'clock with ten 10 x 8s'.

'Everybody had photographed the Duke of Windsor so when I eventually tracked him down the next day I had to think of something new. In the end I took ten photographs of him tying a Windsor knot without showing his face but with the Prince of Wales feathers showing on his signet ring.

'Her only comment was, 'I like your style,' and I landed the coveted *Vogue* contract.'

For Lichfield, working for *Vogue* in the 60s was the ultimate. 'The 60s was a very unique era—I don't care what people say about it. As time goes on it seems more

extraordinary.'

'It was very exciting, but I don't think anyone got too spoilt. We all realized how lucky we were. To be young, unmarried and a photographer then was an extraordinary life. There was quite a lot of money being spent on travel assignments too. Nowadays if you want to take a picture of someone in front of the Grand Canyon, you use back projection and put the model in front of a screen. In those days you just went along to the Grand Canyon itself.

'I was one of those lucky people who came up during that time—it was much easier to succeed in the 60s than now.

'It is a very bad time for people to get started now. Every day we get letters from people wanting to be assistants. I don't try to discourage them but I warn them that it is not all desert islands and girls. They think it's on a beach with a rum punch in one hand and a camera in the other. They don't realize that you spend most of your time running, and if you're not running you're in the dark.'



Figures in a landscape Taken in Sussex and designed to emphasize the British look of the clothes shown



Motor drives and auto winders

An autowinder advances the film automatically at very high speed after each frame, leaving you free to concentrate on following the action of a fast moving subject

Fred Mancini/Cameras courtesy of Ricoh, Chinon and Olympus



In the past, motor drives seemed to be the kind of equipment that only a professional would buy. Professional photographers have long recognized the advantages of motor driven cameras and the availability of a fast motor has always been a strong selling point of the more expensive professional cameras. But nowadays more and more amateurs are becoming aware of their value for winding on film quickly and smoothly, sometimes allowing you to take up to five pictures in a second. At the top end of the range, motor drives are still very expensive, but a basic autowinder may be only a third of the price of a new SLR.

Many modern cameras accept a motor which winds on the film between frames and fires the shutter as well. A few cameras only take an autowinder that saves the photographer the trouble of cranking the wind-on lever. The more sophisticated cameras, however, often accept the faster motor drives.

It is not difficult to see why many photographers keep motors clamped permanently to the baseplates of their cameras. When the subject is changing fast, it pays to be able to take a series of pictures in rapid succession. Some people find that they have to move the

Motor equipped *Although these cameras are all fitted with autowinders, these are not interchangeable devices—an Olympus winder, for instance, would not fit either of the other two cameras*

Free as a bird *When the action is changing quickly, a motor drive or autowinder may help you catch shots you would miss if you had to wind on each frame manually*

camera away from their face in order to wind the film, and that a motor eliminates this distracting procedure. Even still life photographers often use motors on their tripod-mounted cameras, because winding on to advance the film can sometimes move the whole camera enough to spoil a picture. A motor drive allows the film to be advanced without even touching the camera.

These are only a few of the reasons why there has been a rise in the popularity of motor driven photography, and there are many more. The spread of the motor drive can be compared to that of automatic exposure — photographers want to be freed of the mundane details of photography to concentrate on the creative aspects of picture taking.

Autowinders

The simplest device for advancing the film is an autowinder. This is a small attachment that is fixed to the base of a suitable camera, containing a motor, a tiny gearbox, and a set of batteries.

A camera must be designed to take an autowinder—it is impossible to have an autowinder fitted to a camera without the connecting mechanisms on the baseplate. On the other hand, you do not have to buy a drive at the same time as the camera. It is quite feasible to buy, say, an Olympus or a Chinon now, and a compatible winder in a year's time.

Each autowinder (or motor drive) only fits one make of camera. A Canon Auto-



winder will not fit a Nikon. In this respect, they are similar to many types of lenses, but autowinders are even more exclusive, because the winder from one model in a manufacturer's camera range often does not fit the body of another model. The Nikon EM, FE and F3 all have completely separate, non interchangeable motors, for example.

Autowinders are usually limited in scope. No autowinder can wind on the film faster than three and a half frames per second (fps) and most operate at two frames per second.

Many autowinders work only in *single frame mode* which means that the shutter must be manually fired for every shot. To release the shutter, a button is pressed, either on the winder, or the normal shutter release button on the camera. The film is wound on when the button is released. If the button is pressed and held down, only one frame is exposed.

More sophisticated autowinders have a choice of single frame or *continuous* shooting. With continuous winding, film is exposed frame after frame as long as the shutter release is held down.

Even if a winder is said to give two fps, this speed is only achieved when the



faster shutter speeds are in use. If the camera shutter is set to, say, one eighth of a second, the delay caused by the shutter remaining open slows the auto-winder down.

Motor drives

The line between an autowinder and a motor drive is a fine one, but the distinction is usually made on the basis of speed of operation, ruggedness and



Fred Mancini/equipment courtesy of Olympus

Attaching a winder Automatic winders simply engage with the gears in the camera's baseplate and are held securely in position by screwing into the tripod fitting

Autowinder and motor drive Though they look similar, they are quite different internally. The motor drive is much faster, and offers separate, bolt on battery compartments



Vautier/de Nanxe



Power sources Most autowinders have a battery compartment built in and use penlight cells. The battery pack (bottom) fits on to a motor drive, and contains rechargeable cells



Autowinder controls Usually these consist of a switch for continuous and single frame operation, but some winders have settings for shooting a timed sequence of pictures

versatility. Most motor drives operate at a top speed of around five fps, although one unit, which can only be used with a specially built camera, operates at up to ten frames per second.

With film running through the camera at very high speed, it is easy to shoot off a whole roll without really noticing. A 36 exposure roll of film lasts less than seven seconds when the motor drive is running at full speed. It may well be worth asking yourself before you buy a motor drive, whether you can afford to feed its voracious appetite for film. Yet there is little point in having a motor drive if you only shoot one or two frames at a time.

In order to achieve the higher framing rates that a motor drive allows, some sacrifices have to be made. The most obvious of these is weight, but another is the loss of viewfinder facilities—some cameras must have their mirrors locked in the up position when they are being run at high speeds, and this blacks out the viewfinder. But high speed shooting usually demands the use of a tripod, though, so this need not be a great drawback.

The forces generated in moving film through a camera at high speeds can have a very destructive effect on a camera and a motor drive, so motor drives themselves have to be very solidly built. The cameras to which they are attached also need to be well made, and it is rare to find lightweight motor driven cameras.

Motor drives can be used with a variety of sophisticated accessories, and for most motor driven cameras these include data backs, which print exposure information, or day, date and time onto the film. Bulk film backs, which hold

enough film for 250 exposures, are also available. Although these can be used with motordrives, they cannot be used with an autowinder which is insufficiently powerful. Remote control units allow the camera to be operated from mains power, and controlled from a point some distance from the camera. An intervalometer programs the camera to make an exposure at preset intervals—these devices are sometimes built into the motor drive itself, and at least one autowinder is equipped with one.

All motor drives stop automatically when the film comes to an end, to prevent it being ripped off the spool, or the sprockets torn. Some autowinders stop automatically as well, but since many of them are not sufficiently powerful to tear the film, the automatic stop device is rarely necessary.

As an alternative to stopping the film at the end of the roll, many motor drives have a preset count down frame counter. Should the photographer want to fire a burst of, say, ten frames, the counter is set for ten, and the camera stops automatically after ten frames have been exposed. If a whole roll is to be shot, perhaps in a number of short bursts, this supplementary counter is simply set to 36, or 20, depending on roll length.

The ability to rewind film at the end of a roll is limited to the more expensive motor drives and, unless your time is extremely valuable, this is probably a luxury that most amateurs would not want to pay for.

Power sources

All motor drive systems, and some autowinders, can be used with various different power sources.

The two simplest power sources are

non-rechargeable pen cells, either zinc carbon, or manganese alkaline. Manganese alkaline cells usually last longer and give a higher framing rate.

Rechargeable nickel cadmium batteries are also available, either as individual cells or as a large power pack. Nickel cadmium cells give more power than either of the non-rechargeable batteries. While nickel cadmium typically gives six fps, manganese alkaline batteries give a maximum of five and a half fps and zinc carbon give only four fps. Nevertheless to recharge a nickel cadmium battery you need to buy a special charging unit and this is quite expensive. So unless you use the drive a great deal at high speeds, it is probably better still to stick to cheaper non-rechargeable batteries (see page 100).

Some motor drives are supplied as two pieces—one section holds the motor and gears, and a separate pack, which screws onto the motor, takes the batteries. The battery pack sometimes forms a pistol grip which can be used to support the camera.

Battery power falls in low temperature, so manufacturers often make available an optional pocket pack for batteries. This is linked to the camera by a cable, and the battery pack can be tucked under clothing to keep it warm. This may seem like rather an exotic accessory, but the temperatures that are likely to be encountered on a skiing holiday are quite cold enough to bring a motor drive to a halt. Since cameras with electronic shutters frequently draw power from the batteries of a motor drive when one is attached, a separate power pack can be very useful. Not only does it prevent the motor drive from stopping, it also makes sure that the shutter fires at sub-zero temperatures.

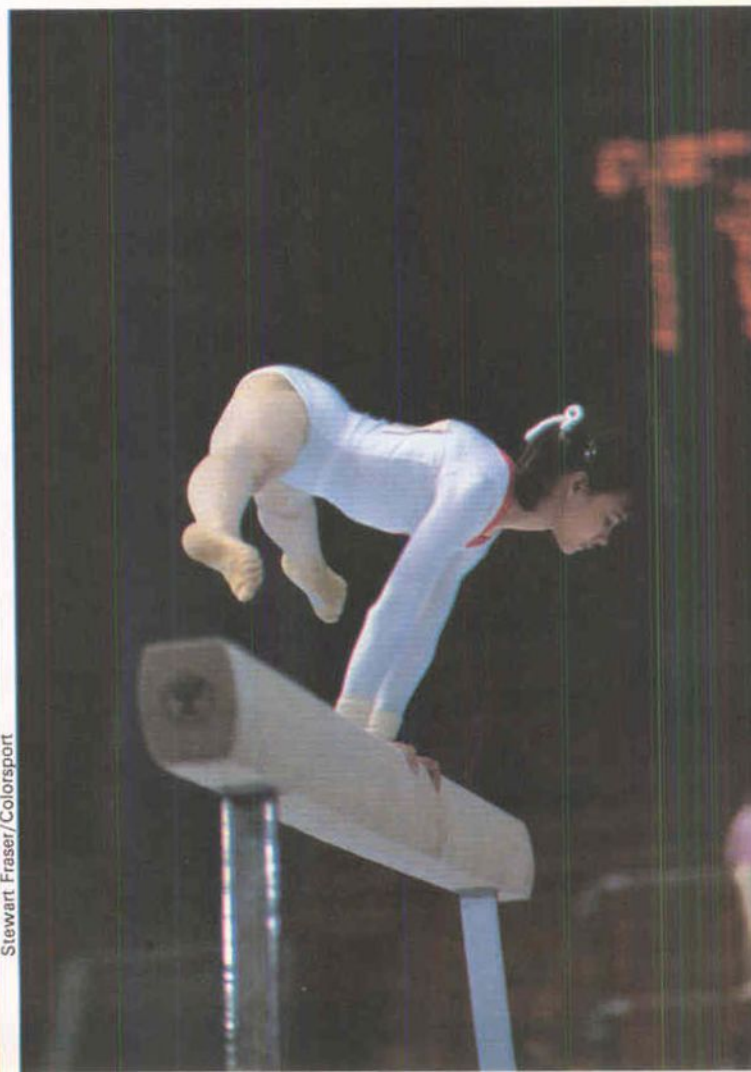
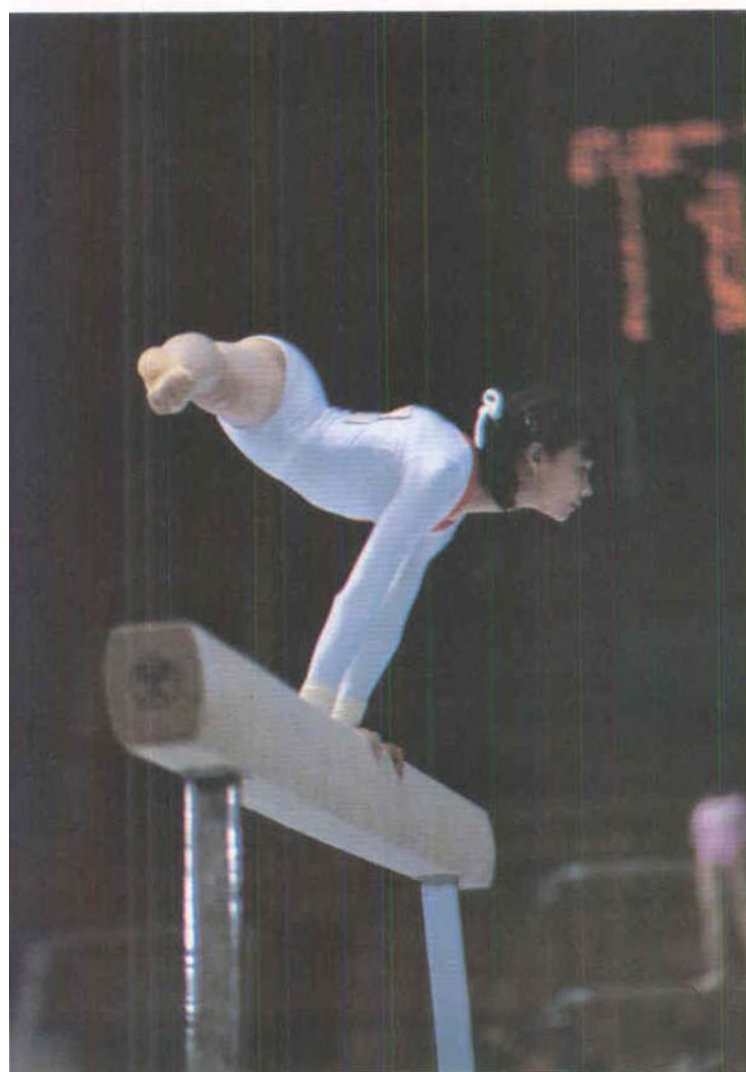
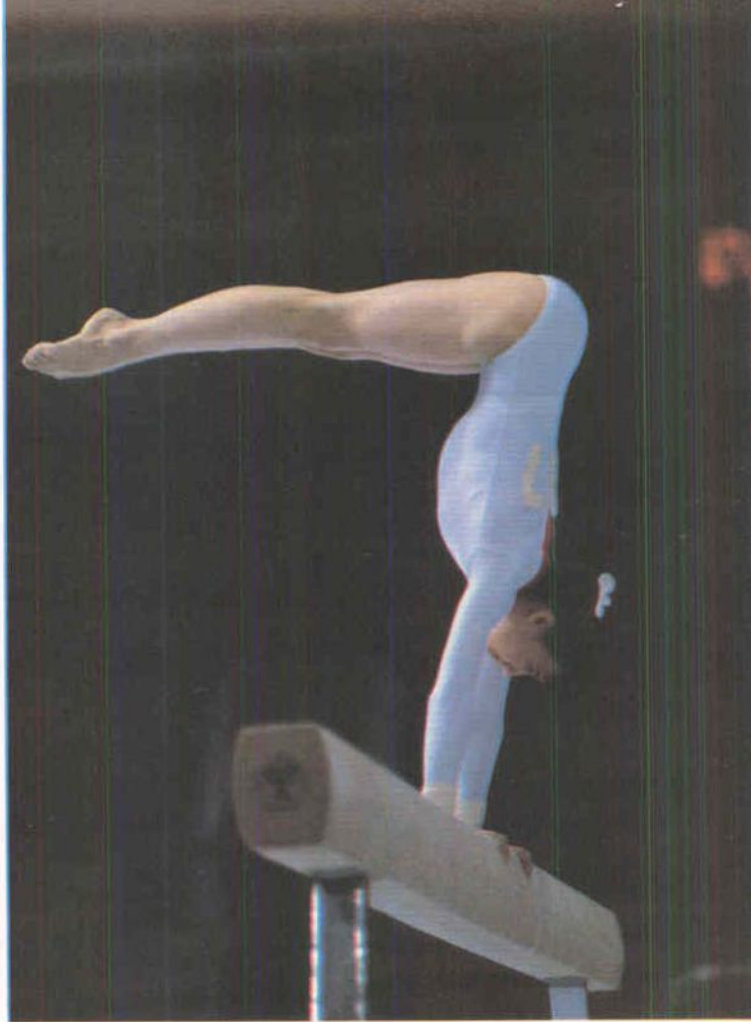
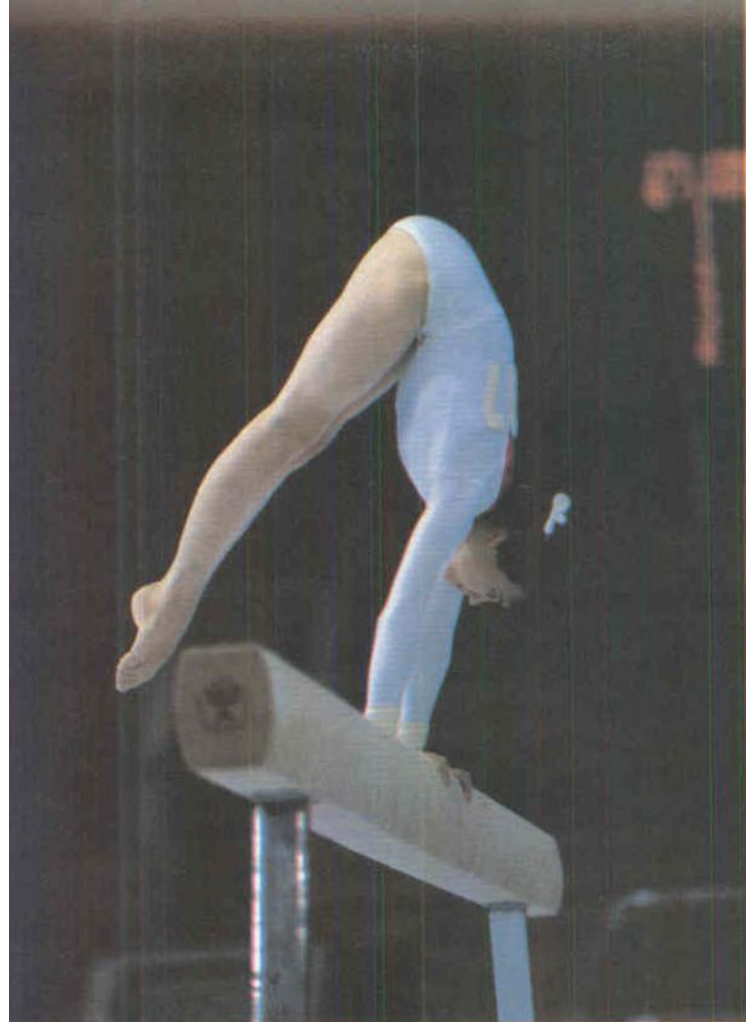
To buy or not to buy?

As with any piece of camera equipment, you should handle a motor drive or an autowinder and become familiar with it first before making up your mind. This should give you an idea of how well made it is, or whether it is too bulky to carry comfortably. The lightest autowinders weigh about 200 g, while the heavier motor drives weigh over 400 g.

An autowinder or motor drive can add a new dimension to your photography, but think carefully before you buy one. If you do not like the extra weight and you do not take many pictures of fast changing subjects, a power drive accessory may amount to nothing more than a 'professional look' to your camera, an aching neck and a waste of money that might have been spent on a new lens. Used properly, however, it could help you take many interesting photographs.

Motors for sport Many photographers use a motor drive not only because it allows fast shooting but also because the automatic facilities leave more time for concentrating on the subject or looking for new ones

Fred Mancini/equipment courtesy of Ricoh, Chinon & Olympus



Panchromatic film

The silver halides in film are naturally sensitive only to blue light, but adding coloured dyes to the emulsion helps film 'see' in colour

Over the years, various attempts have been made to improve the sensitivity of black and white film to colours other than blue.

Sensitizing dyes

In 1873, a scientist called Vogel discovered, almost by chance, the principal of *colour sensitizing* by adding dyes to the emulsion. His discovery was made when he was sent some light sensitive material that had been deliberately stained with pink coralline dye. This dye had the effect of increasing the material's sensitivity to green. He and other scientists immediately began to look for other sensitizing dyes.

For a dye to be a sensitizer, it must be absorbed by the silver halide crystals in the emulsion and must not just stain the gelatine. It must also strongly absorb light of the colours in which sensitivity is required. But, most importantly, the dye should be able to transfer the light energy it absorbs to the silver halide crystals with which it is combined.

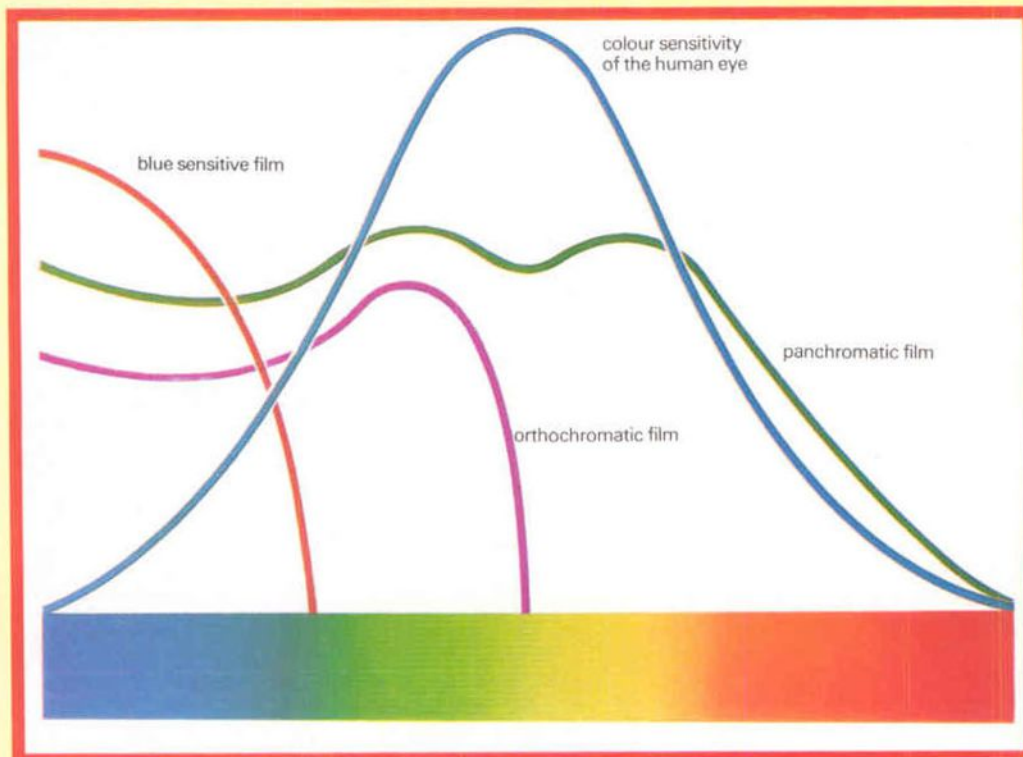
When using black and white film or paper, colour seems to be irrelevant. Yet the colours in the scene have a significant effect on the nature of the final image and black and white darkroom techniques depend upon the response of monochrome emulsions to coloured light.

Colour is important in black and white photography because emulsions do not record some colours as strongly as they do others. Black and white printing paper, for instance, is very sensitive to blue light but insensitive to red. This is why the red darkroom light is 'safe'—it will have no effect on the paper.

Although, for printing paper, the limited sensitivity of black and white emulsion is an advantage, it has always been a nuisance for films. In the early days of photography, many photographers rued the insensitivity of their films to red. On prints, anything red would come out black. This could be particularly annoying in portraiture because any red in the complexion—usually spots and blemishes—would stand out darkly against pale skin.

Sensitizing dye Seen here in a concentrated form, these brightly coloured dyes give film and paper the ability to record other colours of light besides just blue

Colour curves This diagram shows the sensitivity of different types of film to coloured light. Panchromatic film most closely matches the eye



With the early sensitizing dyes, adding another pink dye called *erythrosin* in minute quantities to an emulsion gave *orthochromatic* emulsions—emulsions sensitive to blue and green but not to red. Early roll films were orthochromatic and their reproduction of red as black in a print was well known. Improved orthochromatic sensitizers produced what were called *chrome* films which were the forerunners of present day panchromatic films.

Even the early panchromatic plates and films were not very good. They were much more sensitive to blue than green and red, and a deep yellow filter was needed to give accurate tones in the negative for every colour. Without a filter blue sky came out almost the same density as clouds.

Modern black and white films have much better balanced colour sensitivities. They are still oversensitive to blue but they are reasonably sensitive to green and red, and tonal values in an unfiltered picture are almost the same as the eye sees them in the original scene. The yellow and pale green correction filters which were once part of every photographer's equipment are now used only for emphasizing clouds and contrast.

However, even modern panchromatic film, though

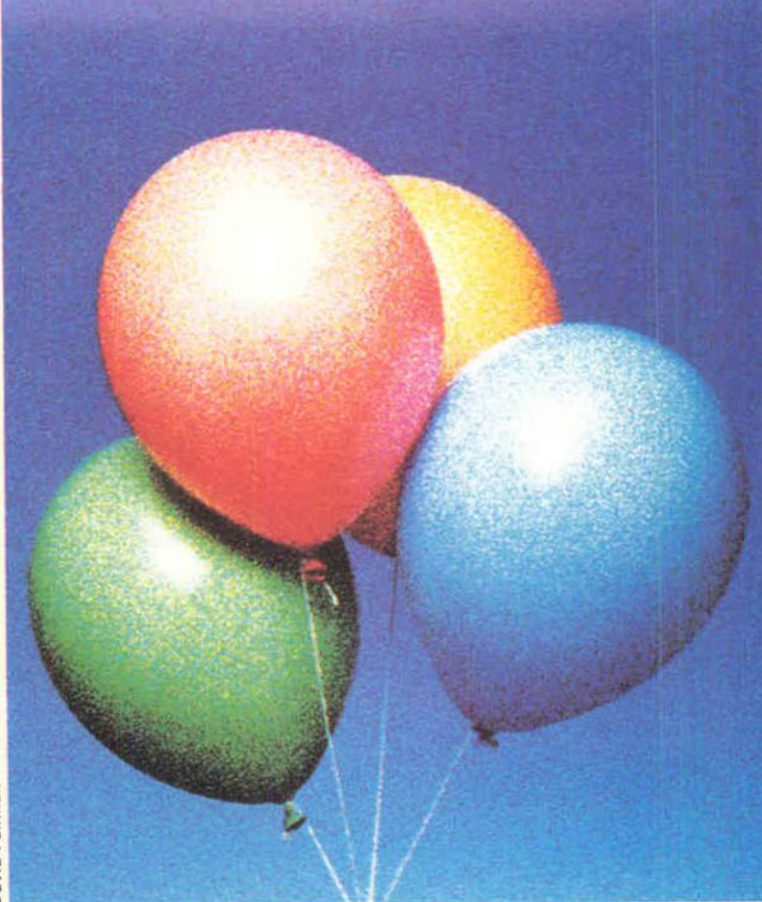
sensitive to most colours, does not respond to deep red. Fortunately, this does not matter much because the human eye also had poor red sensitivity. Some extremely fast films have useful extra red sensitivity which allows them to respond well in tungsten lighting which contains a considerable proportion of red light. Nevertheless, a film with the ideal colour sensitivity has not yet been made.

Multi emulsions

The different colour sensitivities of various materials, can be exploited for particular effects. A variable contrast printing paper such as Ilford Multigrade has two emulsions with different colour sensitivities. One is blue sensitive, has a high contrast and contains no sensitizing dye. The other is a low contrast emulsion that is sensitized towards the green part of the colour spectrum, though it retains its sensitivity to blue. The two emulsions of Multigrade are not coated in separate layers: they are mixed together and coated as one but they still retain their individually sensitive properties.

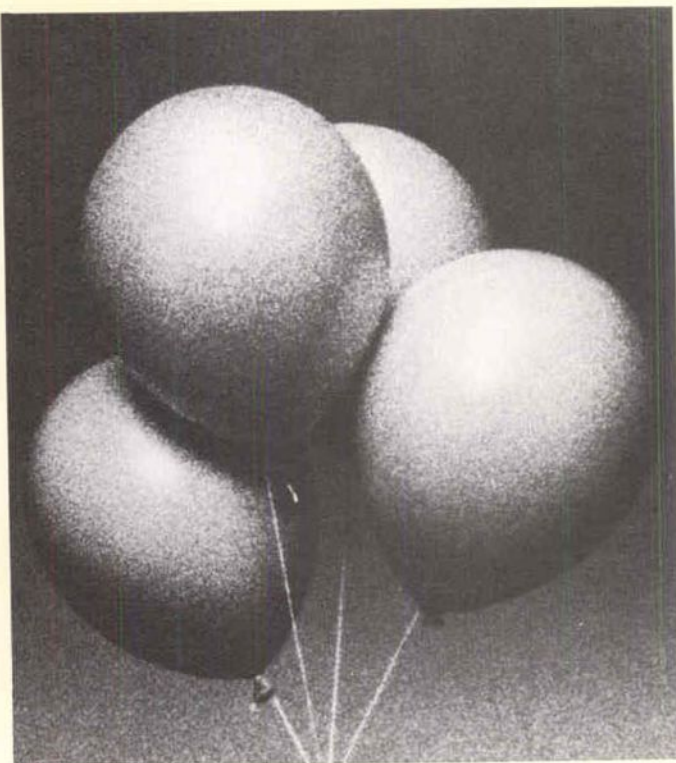
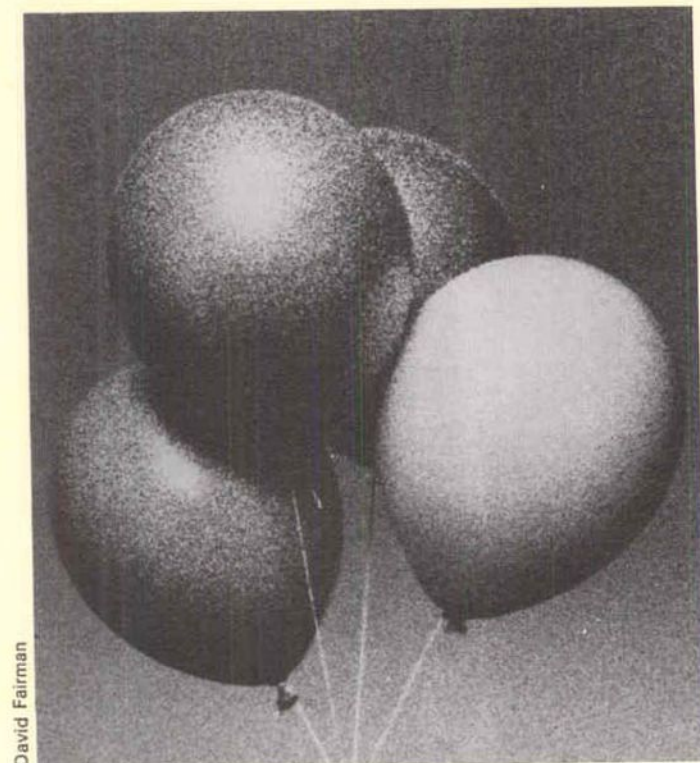
If green light is filtered out from the enlarger light source, with a magenta filter, the blue sensitive emulsion of Multigrade paper responds more than the part that is

David Fairman



green sensitive. Since the blue sensitive emulsion gives high contrast, the result is very hard. By filtering out the blue light with a yellow filter, however, the green sensitive emulsion responds more and the result is a soft grade paper. Intermediate contrasts are achieved by varying the proportions of blue and green in the exposing light.

Balloons Photographing a brightly coloured scene on panchromatic film produces a result that is broadly similar to the tones of the original subject (below) Orthochromatic film is not sensitive to red, so this colour appears too dark, and has excess blue sensitivity, so the sky seems to be too pale in tone (below left)



David Fairman



Creative approach

Raising a smile

Humorous photographs may be difficult to plan or predict, but with a quick eye, a camera at the ready, and a reasonable sense of humour, you will find that the world is full of amusing moments to record

There are no easy rules for taking humorous photographs. If there were, photographers would be rich, and we would be laughing non-stop at the visual images around us. It is difficult to shoot consistently funny photographs and only a few photographers—such as Cartier-Bresson in France, Elliott Erwitt in America and Patrick Ward in England—regularly manage to provoke a smile.

One of the key elements of taking humorous photographs must be patience. So many shots look as if they

have been taken by accident, or as a lucky break, or simply by being in the right place at the right time. But often the photographer may have waited hours for the elements of the picture to fall just right.

One Italian photographer made a year's income in twenty minutes one afternoon in a Catholic church. From a balcony seat he was able to see both the priest and the devotee in the confessional. He noticed that the priest was nodding, and that he occasionally took

a few seconds to bring his head upright again. He could have taken a single shot then and moved off. Instead he waited for the right moment. During the next confessional session the priest continued to nod, and eventually sleep overtook him. At that moment, he took his photograph, unknown to the devout lady pouring out her soul to the sleeping priest. The picture sold all over the world.

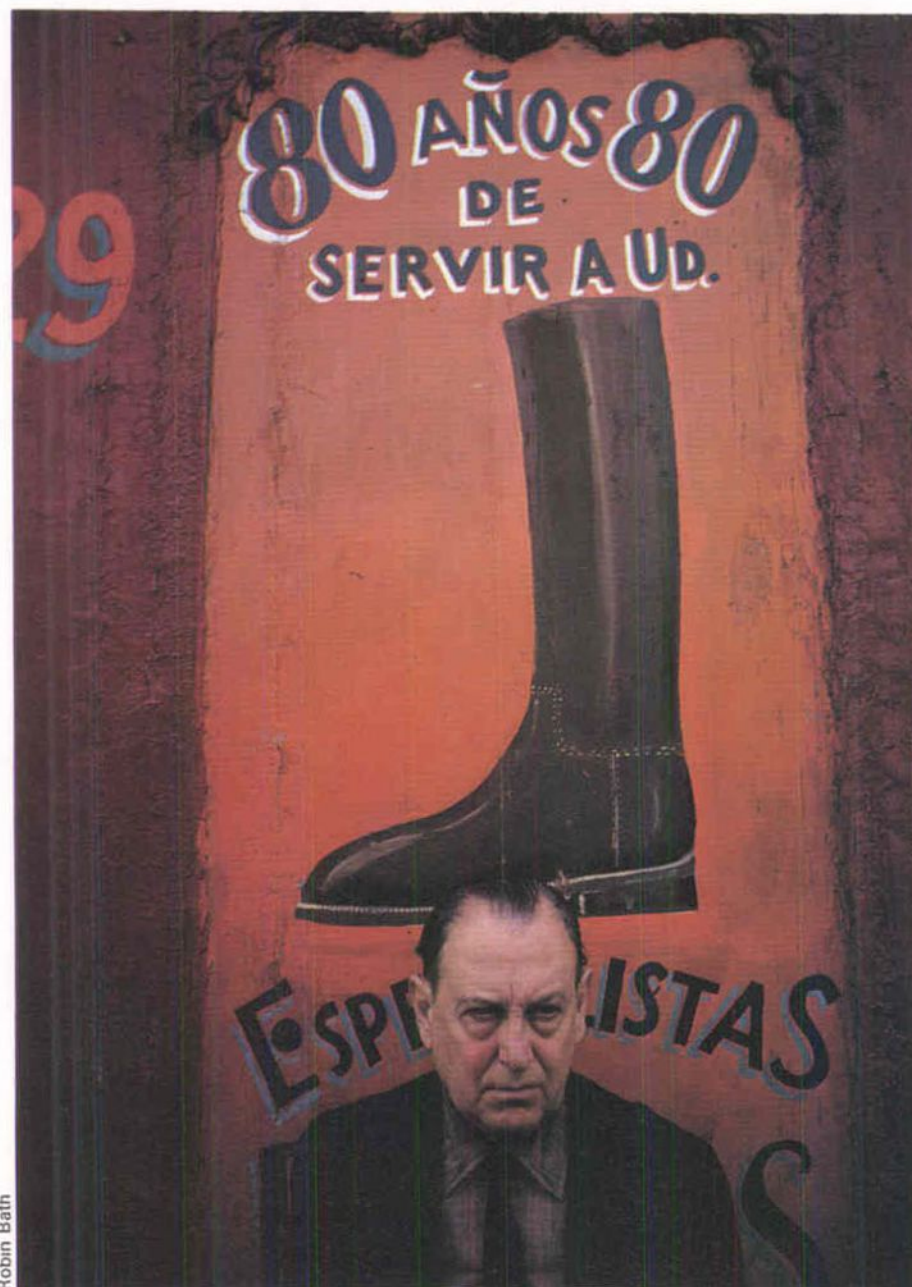
With practice, you can develop an eye for this kind of photographic moment. Most adults are usually careful to avoid appearing foolish, but by introducing a camera into a situation where they are not expecting to be seen, you may be able to catch some delightfully funny off-guard moments. A famous, and much photographed instance is the first day of a sale, when people are so pre-occupied that expressions of greed, despair and rage appear together in a short time.

Another good location is an art gallery, though you may need permission for this, where people are often absorbed in the pictures. There may also be opportunities for some amusing juxtapositions of people and the exhibits—a stern portrait apparently glaring down at the man furtively looking at his watch, for instance, or something similar to the following fictitious example:

Under a painting of three beautiful ladies, 'The Three Graces', is a bench. On it sit two old, and not especially beautiful women. You see this, and you wait. A man comes and joins them, but the situation is not yet right. Then as he leaves, another old lady fills the gap, and you have your picture at last. This photograph is a product of just what you had anticipated and hoped might come about. You waited, and your patience was rewarded with the shot.

Remember that your subjects may well not realize that they are looking foolish. In many successful humorous shots the humour exists only from the camera's viewpoint. The lady, striding with military precision through the park, may be quite unaware that a few yards behind her a battalion of guardsmen echo her footsteps. If she happened to glance over and see the photographer, she would probably take no notice. But the man unlucky enough to go head over heels on the proverbial banana skin would probably not take too kindly to having the

Man and boot *The photographer waited until the grim-faced subject positioned himself directly underneath the painted boot. A sly touch of humour*



Robin Bath

event recorded, and might even vent his anger and frustration on you and your equipment. Be aware of this, and try to be like Cartier-Bresson, an anonymous figure in the background.

The great advantage of photographing family and friends is that you can take the sorts of liberties that would be impossible with strangers. However, the results may only be amusing for those involved and may mean little to outsiders. In order to appeal to a wider audience, the photographer must be more adventurous. It is better to avoid family and friends, and look for funny moments among strangers simply because you can judge the subject slightly more objectively.

Look for people behaving strangely, or people who are out of character with the situation. People taking themselves seriously in funny situations can often be funnier than the situation itself—sober behaviour at a fairground, for instance, or the upright young man at an elegant garden party furtively touching a young lady's bottom while holding a civilized conversation.

You may have to be quick to capture these funny incidents. Automatic cameras have made it much easier to take a picture quickly, but it is worth keeping the camera set with approximately the right aperture and shutter speed combination for the conditions. Use a reasonably small aperture if possible—perhaps $f/8$ —to give good depth of field. If you set the focusing ring to about three metres, the chances are that most subjects will be in focus, even when you have no time to make adjustments.

Generally it is a good idea to keep the camera with you on all occasions, keep it loaded and ready, and familiarize yourself with the controls. You can't always ask for a repeat performance!

Happy accidents

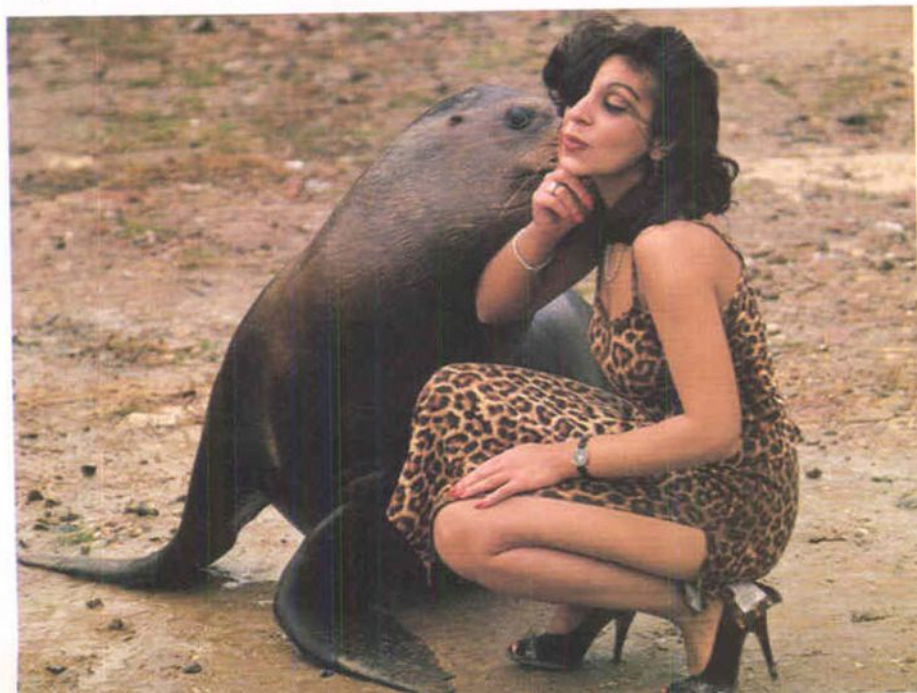
The unexpected moment figures largely in photographic humour, and many humorous moments may not only be a surprise to the subject but also to the

Sealed with a kiss An amusing moment which depends on the improbable combination of the lady in leopard skin and the over-friendly sea-lion

Conversation piece At first glance the couple seem to be enjoying an animated discussion, but a second look reveals the shot as a cleverly contrived one



Victor Watts



photographer. In the same way that a slip of the tongue can produce an unexpected verbal joke, so the accidental photograph can result in an amusing image. Accidental double exposures used to be a common source of amusement—granny standing in the middle of the harbour, for instance, or the children in with the monkeys at the zoo. Modern cameras have made accidents like this rare, but you may be able to make deliberate 'accidents' for humorous effect. Multiple exposures, for instance, can be made on many cameras by making a few adjustments (see page 513).

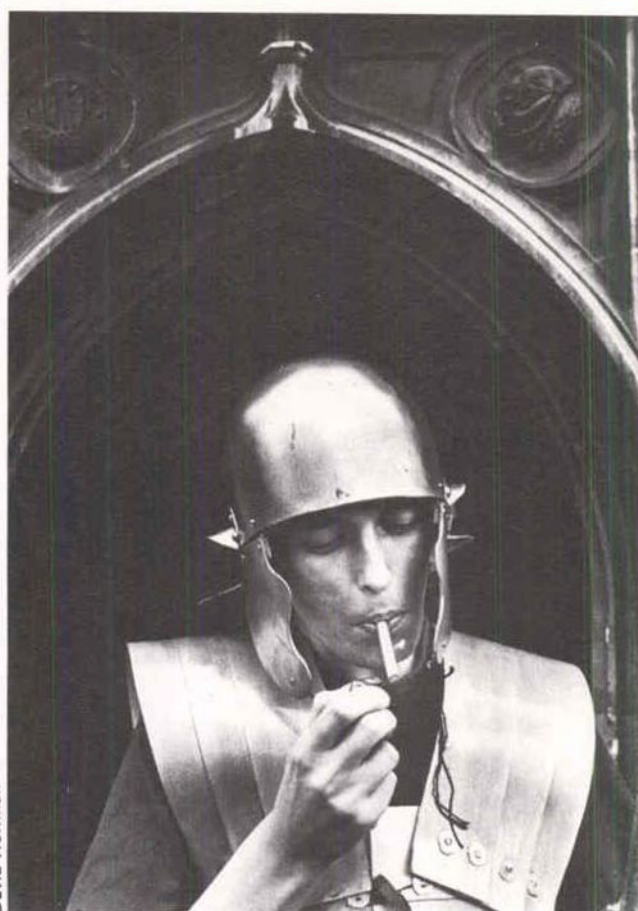
Nevertheless, you may find some funny mistakes by looking at the ends of exposed films. You might have some weird shots on the frames you exposed at the beginning of the film before starting to take pictures properly. The same may happen at the end of the film.

Buziak

John Benton-Harris



David Hoffman



Patrick Ward





Richard Massey

Touch of class You need a quick eye to take advantage of situations like the above. The shot is even more amusing since the occasion is so formal and that this gesture quite furtive.

Light in armour Many humorous moments arise from incongruous juxtapositions. When was the last time you saw a Roman soldier smoking?

Motorbike yoga From time to time, when they think no-one is looking, some people revert to strange practices. This man seems to have turned himself into a yogi. Or it could be that he just fell off his bike! On the other hand it could be a set-up photo.

Poodle and chauffeur This intriguing picture seems to be a lucky candid shot caught in passing. In fact, the car was spotted on a day when the photographer, Thurston Hopkins, was without his camera. He pursued the unusual pair in a taxi and discovered that the man owned a car hire firm and took the poodle for a ride whenever he had some spare time. He was happy to pose the next day. Humorous moments are not usually re-created with much success, but this shot is an exception.

Sheet with a smile The first time that the photographer saw this torn tarpaulin on the rooftops outside his studio it looked very ordinary. But the following week two 'tears' appeared and the 'face' was complete. A photograph well worth waiting for.



Mask of the red death The frame is so full of colourful and distracting images that the joke knife piercing the lady's head is almost lost

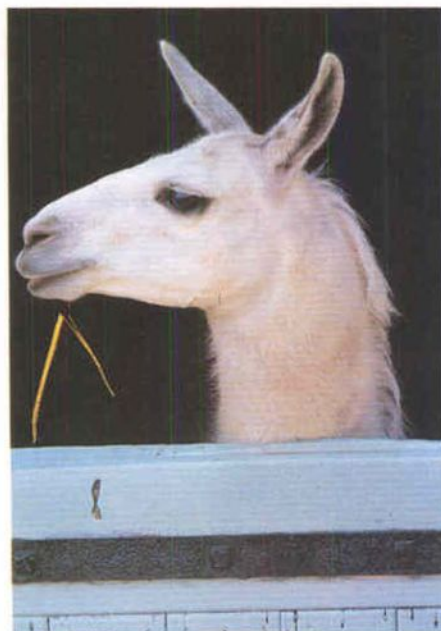
In 1978 the photographers Mark Edwards and Chris Steele-Perkins composed a whole exhibition on this subject. Many of the pictures provoked considerable amusement.

It is possible to exaggerate the characteristics of certain pieces of equipment or create a humorous result by distorting the image. For instance, using a wide angle lens and adopting an unusual camera position can produce an interesting effect. Lie down close to the floor in front of a willing victim, who is sitting on a chair, and point the camera upwards towards your subject. The unfortunate person will appear to have giant feet, tree-trunk legs and a pin-sized head.

By contrast, a telephoto lens can allow you to manipulate the appearance of perspective. With a close foreground and distant background—a road-mender emerging from a manhole, for instance, and a lorry approaching in the background—a telephoto lens condenses the distance between the two. It can appear that the road mender is blissfully unaware of the lorry which appears to be about to decapitate him.

You can produce some very odd images indeed with long exposures. If you were, for example, to shoot a self-portrait using a time exposure of ten seconds or so, keeping your body absolutely still but moving your head from side to side, the effect on film would be of a headless body. Alternatively, you can keep your head still and hold your arms in three different positions for a third of the exposure time each. Although the arms will be a little ghostly,

The last straw Using a telephoto lens enables you to close in on an amusing feature. Here the shape of the ears echoes the shape of the dangling straw



the result should resemble a human insect! To expose the shot for long enough you must usually use a slow film and keep the lighting very dim.

Sequences

Rather than trying to find a single funny shot, you could take a series of shots that combine to tell the complete story of a developing situation.

The famous American photographer Elliott Erwitt once shot a series of street scenes with this purpose in mind. By themselves, the pictures are interesting but not especially funny, but the

whole sequence is far more telling. In the first shot, the main subject appears to be a heated discussion between a group of people. At one corner of the picture a dog roams, looking just like a casual observer. By the second shot the dog has definitely lost interest in the discussion, and turns away with a look of disdain. It is gradually made apparent that the subject of the photographs is in fact the dog, rather than the street commotion. In the final picture, the dog is shown cocking its leg at a nearby tree, and the joke is complete. Erwitt had sensed that this was a possibility, and waited the necessary time in order to capture the story which would have been impossible to show properly in one single picture.

Finally, why not try to set up your own humorous incident, instead of waiting for something to happen. Far from being a frustrated observer, praying for that funny moment, you can become director of the action. Many photographic jokes are simply the result of peculiar juxtapositions. Once you have an amusing idea, and perhaps a couple of willing friends to act as models, you can set your own scene. For instance, one photographer saw a lorry with a 'no hand signals' sign on the back. With the co-operation of the driver, who had stopped for lunch, he positioned the lorry on the road, and persuaded his friend to get inside and to stick a booted foot out of the window, as if indicating a right turn.

Road signs and general instructions such as 'approach with caution: these animals are dangerous', when combined with contradictory images, can be the source of much visual amusement. You can try to get people to play up to the camera, but results vary: some people look very funny on film: others do not, however hard they try.



Using hand-held meters

Most modern cameras have built-in light meters that cope well with nearly all exposure problems. There are times, though, when using a hand-held meter will help you take even better exposed pictures



Tapdance

Every photographer knows that for high quality photographs, accurate exposure is essential and, nowadays, most new cameras have built-in exposure meters. Built-in meters undoubtedly help even the most inexperienced photographer to achieve good results in most situations, but there are occasions when it pays to use a separate hand-held meter.

Hand-held meters are intrinsically no more accurate than built-in meters and measure light in much the same way. The difference comes in the way photographers tend to use them.

With a built-in meter, the normal technique for taking a reading is simply to line up the camera on the subject as if you were going to take a picture. The meter then gives a general reading for all or part of the scene you can see through the viewfinder—depending on whether the meter is *overall*, *centre-weighted* or *spot* (see page 364).

This system is quick and easy to use and gives good results most of the time.

However, it is only reliable if there is a fairly even mixture of tones in the scene—some dark, some light, some in between—with no particular extremes. More significantly, perhaps, it also assumes that all or a large part of the scene is equally important and that there are no small areas of interest. With centre-weighted and spot meters the middle of the picture has more effect on the reading, but even with these the 'read' area is large.

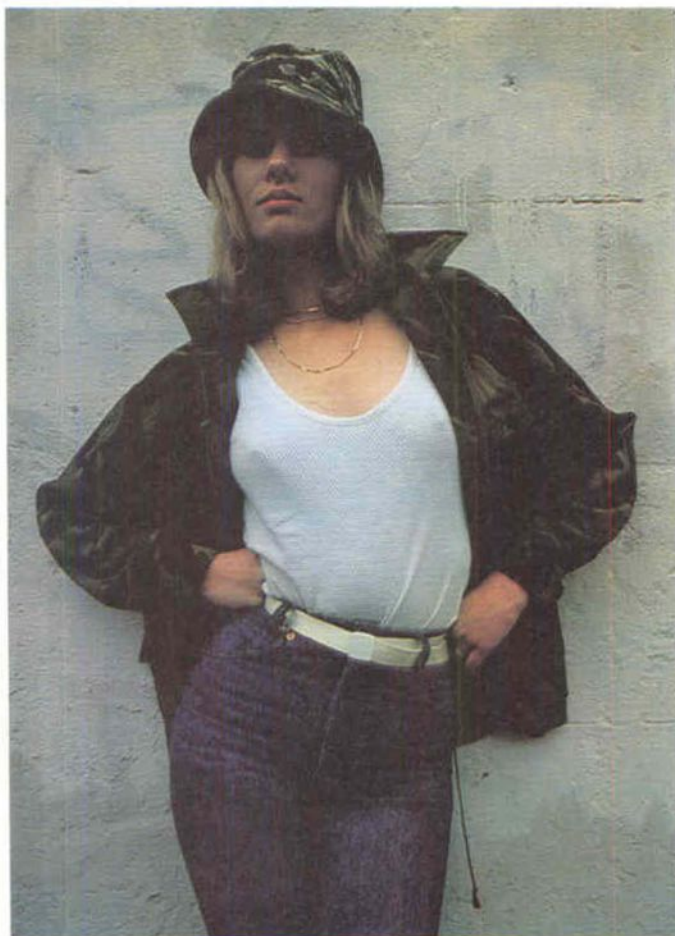
A hand-held meter encourages far greater care in exposure although it takes longer to use. It encourages you to not only make the general reading that you make with the built-in meter, but also to single out areas within the scene and meter them individually. There are a number of other special metering techniques that can be used to ensure correct exposure and all of these are much easier with a hand-held meter than a built-in type.

It is possible to practise these special

Bob Marley *A good overall exposure reading of a brightly lit stage can be taken by briefly pointing an incident meter into the stage spotlight beam*

metering techniques with a built-in meter, but it is generally more awkward. It would be a nuisance, for instance, to have to unclamp your camera from a tripod to make special readings. Similarly, because you have to put your eye to the viewfinder to read a built-in meter, special readings can be physically awkward—to take a light reading for a portrait 10 cm away from someone's face, you actually have to stand that close. Indeed, some metering techniques, such as incident light metering (see below), cannot be done with a built-in meter without a little trickery.

For the special metering techniques outlined here, then, you should use a hand-held meter. You can use a built-in meter, but this makes life difficult and may tempt you to make short cuts.



Light background Taking an exposure reading from a light background can lead to underexposure, left. A built-in meter 'sees' the background as a brightly lit grey surface. A shot with incident metering, right, give better results



Dark background The opposite problem occurs with a dark background, left. Reflected light meters cannot be relied on to determine correct exposure, but incident meters are unaffected by subject reflectivity





Clay Perry

Average background A subject with an average range of tones is interpreted similarly by both incident and reflected light meters

Exposure

Although the precision of the light meter may lead you to believe that there is only one 'correct' exposure for every scene, exposure is often very much a compromise. Normally, the aim is to record detail in every part of the scene, both shadows and highlights, including all the tones between white and black that correspond to the tones in the original scene.

However, the human eye can cope with shadows and highlights far better than a film can. While the human eye will see detail in both shadows and highlights when the highlights are 1000 times as bright as the shadows—a brightness range of 1000:1—a black and white film can only cope with a range of 128:1.

You can use a hand-held light meter to see if the brightness range is too great for the film to cope with. Move into the scene and take a reading from the lightest part of the subject and then the darkest. If the difference between the two readings is more than seven f-stops, the brightness range is too great for black and white film to cope with. This does not mean that you cannot take your picture. It simply means that you must compromise and decide whether to overexpose the highlights or underexpose the shadows.

Colour print film can show detail in dark and light areas with about seven stops difference in brightness. Colour slide film can only manage a five stop range of brightness.

Inevitably, then, some of the detail the photographer sees in the original scene must be lost. Just what is lost depends upon the exposure. If you give a short exposure, shadow detail will be lost; if you give a long exposure there will be good detail in the shadows but the highlights will be 'burnt out'.

For black and white film, the traditional method is to expose for the shadows and let the highlights take care of them-

selves—that is, exposure is the minimum necessary to give good detail in the shadows. This does not mean that you take your meter reading from the shadows only, but simply that it is normally preferable to allow the highlights to burn out a little in order to get good detail in the darkest areas.

This policy works reasonably well for colour negative film as well, but not for colour slide film which gives unpleasant desaturated colours in the highlights when it is overexposed. Exposure for slides, therefore, is normally biased toward the highlights.

The exposure should really be chosen to give the sort of photograph you want. If you want detail in the highlights most, expose for these; if you want shadow detail picked out, expose for these. Once you have decided what you want, you can use a hand-held meter to help you establish what exposure gives you the effect you want.

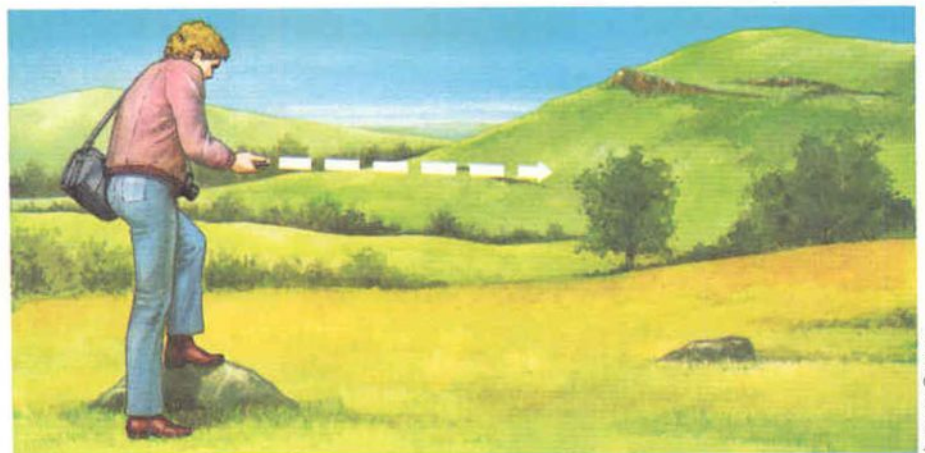
Reflected light

Like built-in meters, most hand-held meters are designed to measure light reflected from the subject. These meters are referred to as *reflected light* meters. *Incident light* meters are also available and they are used to meter light incident (falling) upon the subject rather than reflected from it. Some meters can take both reflected and incident light readings. The procedure for taking a reading varies from meter to meter and you should refer to the manufacturer's instructions.

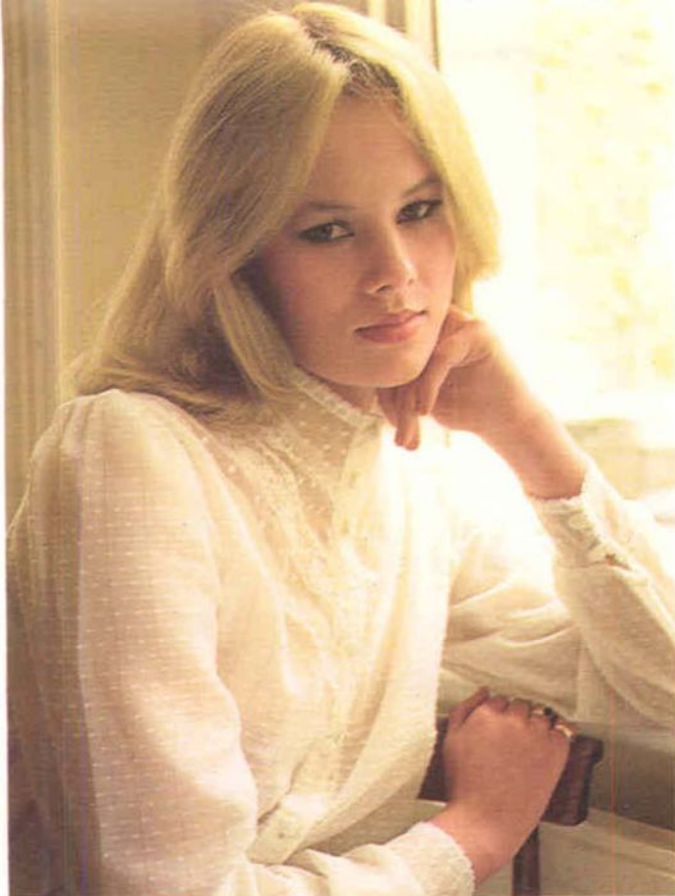
Reflected light readings can be taken in a number of ways, the most common of which is a general reading similar to the reading you take with a built-in meter. The meter is simply held next to the camera and pointed at the subject. Because the meter responds to exactly what the camera records—the light reflected from the subject—this method normally gives good results.

You should check, however, that the meter has a similar angle of acceptance (see page 364) to the lens on your camera. Typically the meter's angle of acceptance is about 45° which corres-

Pointing the meter Unlike a built-in meter, a hand-held meter does not make allowances for bright skies. For accuracy, aim it slightly downwards



Jeremy Gower



Exposing for shadows Giving a greater than normal exposure reveals detail in the shadows, but tends to wash out the detail in the highlights—in this case, the window



Exposing for highlights With a shorter exposure, detail in the highlight areas is visible and colours are more saturated but shadow and midtone detail are lost

Clay Perry

ponds to the angle of view of a standard 50 mm lens. You should bear this in mind when changing lenses. While a TTL meter automatically adjusts for different lenses, a general scene reading with a hand-held meter may give incorrect exposure when you have anything but the standard lens on the camera.

Nevertheless, as long as direct sunlight does not catch the meter cell—shade it with your hand if necessary—a general scene reading gives acceptable exposures for most subjects. However, it is worth examining the scene to see if you might improve your results by exposing for particular areas.

Tilting the meter

Landscapes, for example, and indeed other photographs, often include a large sky area. This has a considerable influence on general scene readings, and you may get two widely different readings with two similar views, simply because you include different proportions of sky. If you include a large area of sky in the frame, shadow detail could be lost on the ground if you only take a general scene reading.

Whether it is a landscape or a building you are shooting, aim the meter down towards the ground to get your reading. Start with the meter towards the sky and slowly tilt it downwards. The reading will drop rapidly at first and then become steady once all the sky is excluded. If you use this steady reading directly for your exposure, the sky may well be a

little burnt out. Unless you want a featureless sky, therefore, you should expose at one stop less than indicated.

Closing in

When the main point of interest is fairly small in the frame—a small figure against a seascape, for instance—a general scene reading may again give an unsatisfactory reading since it will be influenced mostly by the brightness of the sea. In this instance, move in close to take a reading directly from the figure.

Portraits particularly benefit from this metering technique, whether outdoors or in the studio. Your reading should be taken with the meter held at a distance of 15 cm in front of the subject's face.

Out of doors, close-up meter readings may sometimes give false results if your point of interest is some distance from the camera. Haze between the camera and the subject can result in overexposure, especially on a sunny day. So you should again expose at one stop less than the close-up reading indicates.

Key tones

Areas that are coloured very dark or very light can also fool a reflected light meter. Even under identical lighting conditions, a meter will indicate that more exposure is needed for a very dark coloured object than for a very light coloured object. This is because dark colours reflect less light than light ones. A meter simply indicates that there is less light, without showing why. If you follow the exposure indicated by

Compromise exposure Taking an exposure reading from a middle tone gives an exposure that fully exploits the contrast range of the film

the meter, therefore, a black curtain would be rendered grey in the final photograph. To keep the curtain black, you must use an exposure that is less than that indicated by three or four stops.

A white subject, on the other hand, may need three or more stops exposure than that shown. Learning to predict whether or not you need to adjust the recommended exposure, and by how much, only takes a little experience. For mainly dark subjects, you should normally give less exposure than the meter suggests by using a smaller aperture or a faster shutter speed or both. For mainly light subjects the opposite is true.

Tone cards

One valuable technique for ensuring that important areas of the picture are correctly exposed, whether in shadow or light, dark or light coloured, is to measure exposure against a reference tone.

This reference tone may be anything that corresponds to the subject. If shooting distant grassy hills, for instance, you can point the meter at the grass nearby. Providing the lighting is identical, the meter reading for the grass gives the right exposure for the distant hills.

Similarly, you can point the meter at your hand to get a reading for a portrait—again providing the lighting on the hand is identical to the light on the sub-

ject. This can be useful when shooting in a hurry or when you cannot move near enough to the subject to take a close-up reading. Many news photographers prepare their exposure in this way, while waiting for a celebrity to emerge from a building.

One of the most useful reference tones is a grey card and Kodak produce a neutral, 18 per cent reflector card for just this purpose. In the final picture, this card would come out medium grey if given the correct exposure. Exposing for this grey card gives a good range of tones either side of a medium grey. It may miss out on detail in the extreme highlights or dark shadows, but ensures that the negative is neither very thin nor very dense.

Some photographers also use a white card in some circumstances. This provides a highlight reading. The highlights will be properly exposed on black and white film if you give about 3 stops more exposure than indicated when you point the meter at the card. It may be particularly valuable when using colour slide film and helps to avoid over-exposing the highlights. It can also be valuable in very low light conditions when your meter is insufficiently sensitive to give a reading.

Subject brightness range

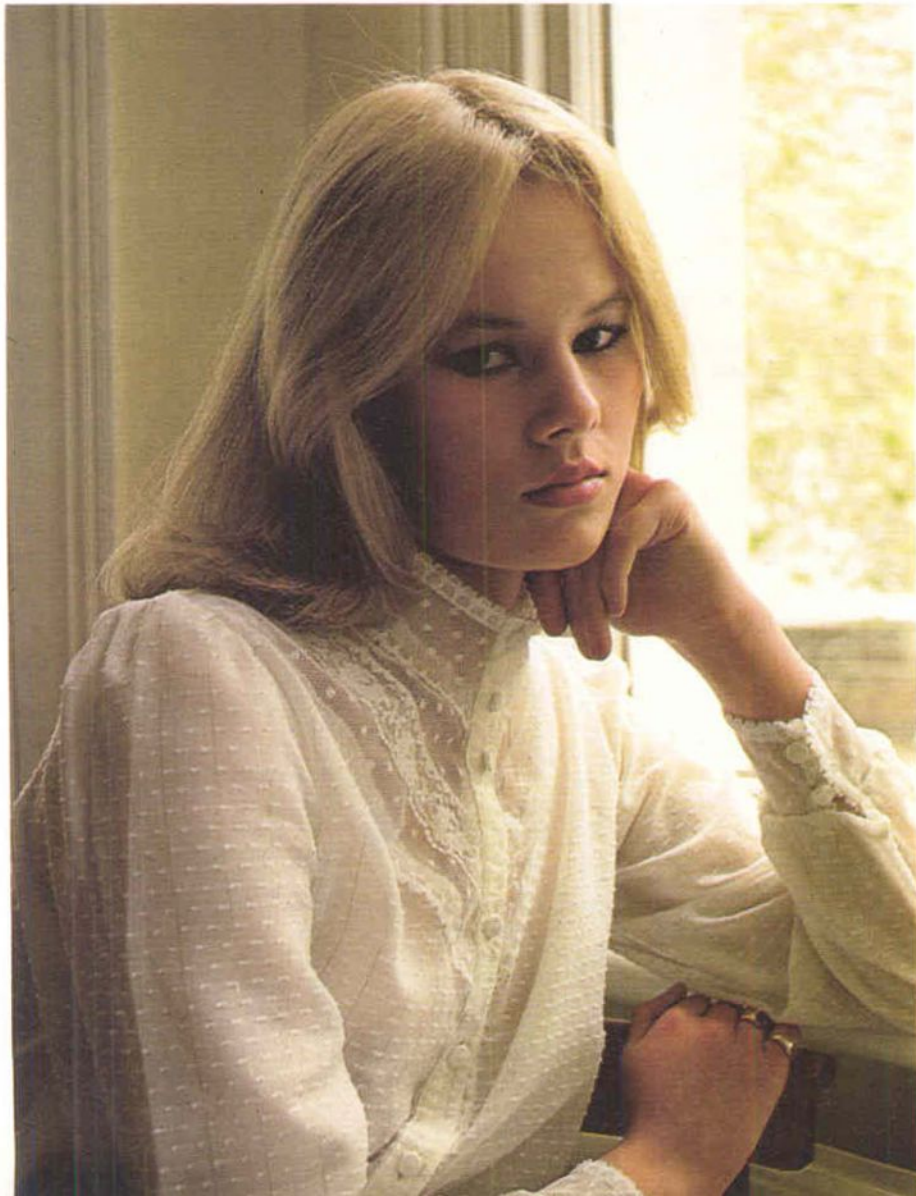
Exposure adjustment in f-stops	Brightness level	Typical subject
+3	Diffuse highlights	White clouds, snow, white paint
+2	Light tones	Very pale skin, light blue sky, dry white sand
+1	Medium light tones	Pale skin, weathered wood, foliage, red brick, deep blue sky
0	Middle grey	Kodak neutral test card
-1	Medium dark tones	Dark skin, dark foliage, tree trunks
-2	Dark tones	Very dark skin, most dark clothing
-3	Very dark tones	Textured black objects
-4	Black	Untextured black

To use this table, take a light reading from a subject of about the same tone as one of those listed in the right-hand column. The exposure adjustment that needs to be applied to correctly expose the subject is listed in the left-hand column. These figures are only approximate and may vary in individual cases.

Advanced metering

Experienced photographers often use complicated systems to determine the correct exposure. Such methods as the Zone System and the YOB System are ways of working out the precise effects of exposure on the final picture. These systems will be dealt with more fully later, but in general they mean taking several brightness measurements from various parts of the scene, usually with a spot meter that takes exposure readings from a very small area. The different brightnesses of the scene are then related to the way they will appear in the final print or slide.

For example, if the photographer knows that pale skin tones usually look best in the print if they have been given twice as much exposure as a neutral subject, such as a Kodak grey card, then he can simply take a reading from a skin tone and set an exposure that is one stop higher than that indicated by the meter. With the exposure needed for this important tone known, the photographer can then determine which other tones will be over- or underexposed. Then, adjustments to the composition of the picture or the lighting, if some important detail of the subject needs to be brought into the brightness range of the film, can be made. More advanced applications of these methods may even involve adjustments to the development time given to the film in order to adjust the contrast of the picture. The accompanying table uses information determined by Kodak, and shows the relative brightness of several subjects lit by the sun. Use the table to work out the exposure compensation you need to apply to a meter reading from any part of your subject.



Clay Perry

Darkroom

Colour printing—1

Jon Bouchier

If you are familiar with black and white processing techniques, it should be relatively easy to move on to simple colour processing—starting with handling and processing colour printing paper

Although some amateurs feel that it is beyond them, making colour prints from negatives is relatively straightforward with modern processes and papers. Like all colour work, colour printing demands great care and precision, but it should prove well within the scope of anyone who can confidently handle black and white printing.

There are two major problems that you must come to terms with when learning to make colour prints from negatives. First of all, because colour print paper is sensitive to more than just blue light, you must not use a safelight intended for black and white printing when making colour prints. A special dark amber or brown filter is needed. Follow the paper manufacturer's instructions on the choice and use of a suitable type.

Colour print paper is extremely sensitive and fogs very easily giving the paper an overall coloured tint. You should be particularly careful not to use a safelight too bright or too close to the work surface. You must not leave paper out under a safelight for long.

At the correct intensity and distance, a colour safelight can do little more than guide you to your equipment. The level

of illumination is inadequate for judging print density. Because of the dangers of fogging and the low level of safelight illumination, it is worth working as much as you can in darkness, particularly when actually exposing the print.

The second problem is achieving the right colour balance in the final print. Ideally, every negative could be printed straight onto the paper. Unfortunately many factors prevent this from happening and without some adjustments, your prints might appear, for instance, too yellow or too red. The nature of the light when the photograph was taken, the colour of the enlarger light source, minor variations in the voltage of the electrical supply to the enlarger, the age of the enlarger bulb, variation in colour response of printing paper from batch to batch—all these may upset the colour balance.

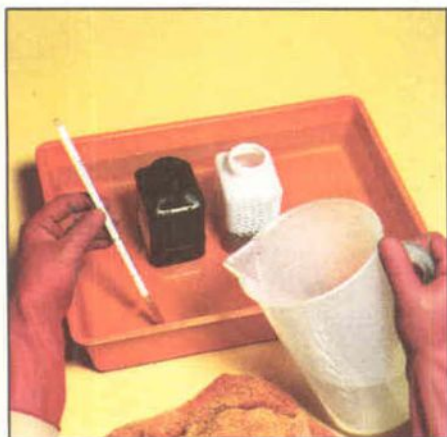
To correct for these variations, the colour of every print must be carefully adjusted with filters placed between the enlarger light source and the printing paper. There are various methods of filtration (covered in a subsequent article), but for consistency and ease of working, your enlarger should be equip-

ped with a special *filter drawer* or, ideally, a *colour head*. Colour heads are normally only found on the more expensive enlargers.

Besides that needed for filtration techniques, little extra equipment is required for colour printing from negatives. Providing it has a good quality lens your normal enlarger should be adequate. Your standard containers for chemicals will also do—but they must be washed carefully after use. If you can afford it, it is worth keeping a separate container for use with each of the chemicals for colour printing. As with processing colour negative film, however, accurate temperature control is vital and a good mercury thermometer is essential. A spirit thermometer is just not precise enough for colour work.

As in black and white printing, you can process colour prints in dishes like those used for black and white, but it is generally much more convenient to use a special *print processing drum* for the job—especially if your darkroom facilities are limited. This is similar to a film developing tank but larger. It enables you to process a single print in normal room lighting, after the exposed

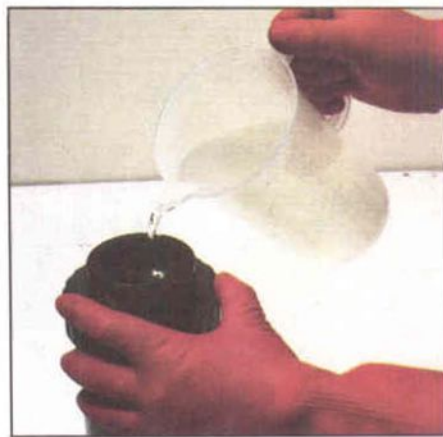
Using a print processing drum



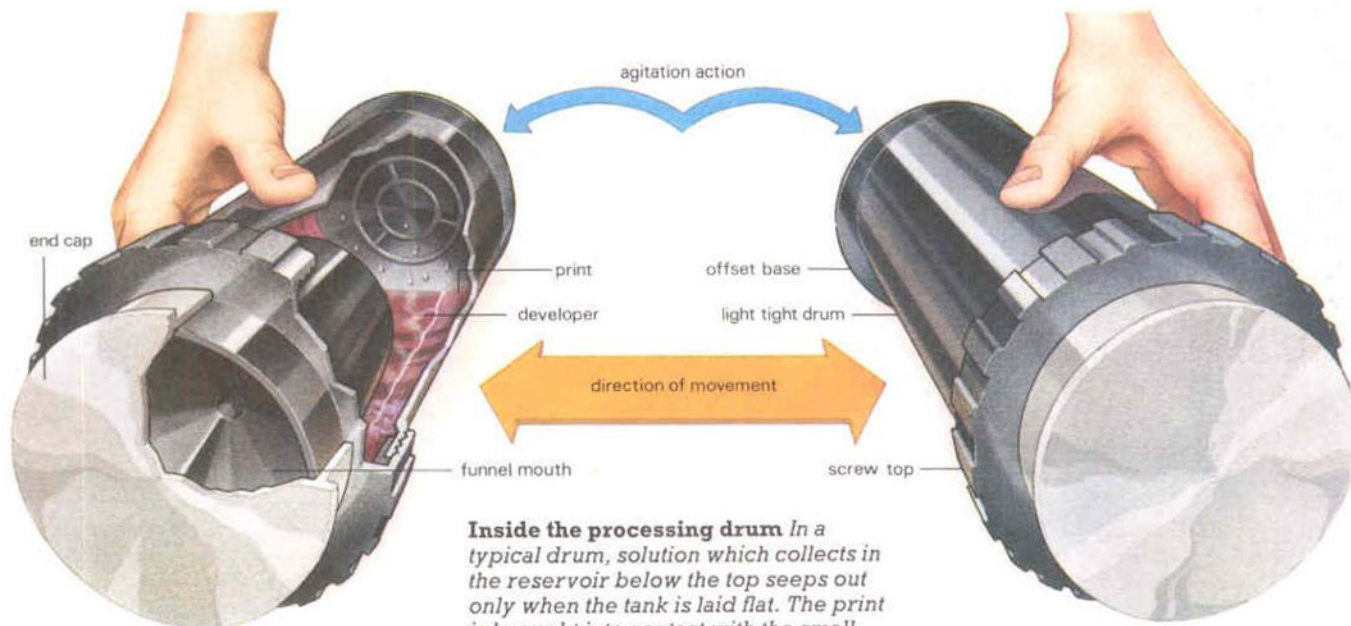
1 Mix up enough developer, stop bath and bleach-fix for several processing runs, and keep these solutions at the correct temperature using a waterbath



2 Expose the print and, in darkness, load it into the drum with the emulsion surface curved inwards. Handle the print by the edges only



3 If you use a preheat bath, pour in some clean warm water that is slightly warmer than the processing temperature. This bath lasts a minute



Inside the processing drum In a typical drum, solution which collects in the reservoir below the top seeps out only when the tank is laid flat. The print is brought into contact with the small amount of solution by rotating the drum



4 During the preheat, measure off the required amount of developer and bleach-fix. Discard the preheat bath, then pour in the developer. Cap the tank



5 Development starts only when the tank is laid down. Immediately, start agitating the tank to and fro. The tank must roll over more than once



6 Drain off used solution for re-use or discard it. Follow with the other process baths, remembering to include drain and refill times in the overall time

Jon Bouchier

Paul Williams

Jon Bouchier

Colour print processors

These are four of a number of widely available colour print processes which are designed for use by amateurs. All are 'short cycle' processes which involve just a few simple steps and brief processing times



Jon Bouchier

Kodak Ektaprint 2

Process temperature: 33°C

1. Developer: 3½ mins
2. Bleach-fix: 1½ mins
3. Wash: 3½ mins
4. Drying: less than 85°C

This process is for Kodak Ektacolor type papers. It consists of three-part developer and two-part bleach-fix liquid concentrates which are simply diluted with warm water ready for immediate use. Another kit, the Ektaprint 3 process, contains in addition a stabilizer bath which follows the wash, but is essentially the same as this one. Processing must be carried out only at the recommended 33°C

Photocolor II

Process temperature: 34°C

1. Preheat: 1 min
2. Developer: 2/3 mins
3. Stop bath: ½ min
4. Bleach-fix: 1½ mins
5. Wash: 3 mins
6. Dry: less than 85°C

This process can be used either for Agfa type or, using an additive, Kodak type paper. The first of the two times listed for the developer applies to Ektacolor 78 paper, the second to Ektacolor 74, Photocolor RC and Agfa papers. Process temperatures between 26°C and 38°C may be used. The makers recommend use of the preheat technique

Tetenal PK and PA

Process temperature: 30°C

1. Preheat: 1 min
2. Developer: 3/3½ mins
3. Stop bath: 1 min
4. Bleach-fix: 2½/3½ mins
5. Wash: 3 mins
6. Dry: less than 85°C

The PK process is for Kodak type papers, the PA process is for Agfa type papers. The developer and bleach-fix times are for the PK and PA kits respectively. A choice of process temperatures up to 40°C can be adopted. Agfa type 4 papers are processed in double-strength solution. Remember to include drain and refill times in overall times

print has been loaded under safelighting or in complete darkness.

Although you can normally only process one print at a time, the benefits of drum processing are obvious. Because processing is carried out in full lighting, there is much less chance of making a mistake. With dish processing, mistakes are easily made because you are often in a rush and have to operate in the near darkness of a colour safelight.

Unlike normal film developing tanks, print drums are used horizontally. A small quantity of fresh solution is used for each print, but the volume of this is insufficient to cover the whole print. The drum has to be rotated to soak all parts of the print momentarily but frequently during the course of each processing stage. After use, the exhausted solution is discarded. The drum must be cleaned and dried thoroughly before the next print is processed.

If you want to make a large number of prints in a hurry, it can sometimes be more convenient to process them in

dishes. But you must be careful not to contaminate developer with bleach-fix, and you must time the process carefully. It is better to stick to drum processing when you first start colour printing.

Paper

There are two basic types of colour printing paper widely available: those based on the Agfa principle (type B paper) and those based on the Kodak principle (type A papers). You usually have to match the process chemicals with one or other of these two paper types. Some processes can be used for both, but for the best results, you should match paper and process types properly. Because manufacturers try to match their positive (print) material as closely as possible to the characteristics of their negative material, it is usually better to use Agfa type paper if your photographs have been taken on Agfa-color negatives; and Kodak paper with Kodak type film. Slight colour imbalance may otherwise result.

Processing chemicals

In the past, colour print processing could involve seven or more distinct processing steps and some professional processes are still equally complex. Modern processes, designed specifically for the amateur, are much simpler and shorter—they are often referred to as short-cycle processes.

Typically, short-cycle processes have only three or four steps. All of them begin with developing in a colour developer and follow this with a bleach-fix ('blix') bath. After the bleach-fix, the print is washed in water and then given a stabilizing bath, with some papers. The procedure for a typical process is shown in detail in the accompanying pictures but, to avoid problems, a few points need to be borne in mind.

Faults in print processing normally stem from three things: temperature fluctuations, variable agitation, and the degree of exhaustion of the developer. Even small errors can severely affect print quality.

Other methods of print processing

You can use other methods for processing your colour prints, starting with a simple dish arrangement of the various processing solutions. A thermostatically controlled dish warmer is an essential item. The advantage of this method is that you can process a number of prints simultaneously—however, dish processing does mean you have to spend longer in near darkness. A tempering unit which includes a motorized drum agitator such as the Jobo model (right) is costly, but a really useful accessory if you plan to do a lot of colour processing. The Durst processor (far right), is very sophisticated—it is a continuous feed processor which takes much of the physical effort out of print processing



Jon Bouchier

Temperature control You can maintain high temperatures by using a water bath for both drum and dish methods of colour print processing

Developer life

Most short-cycle colour print processes are 'one-shot' processes—that is, the chemicals are used once and then discarded.

Colour developers usually have a relatively short shelf life, especially when diluted to working strength or if partly-used. Bear this in mind when planning printing sessions to avoid unnecessary waste. Take care, also, not to use a particular quantity of solution to develop more prints than the manufacturers recommend. Mark on the solution container label just how many prints have been through the developer if you cannot use all the solution in a single printing session.

If possible, prepare fresh working strength solution just before printing begins. In processes that use a stabilizer bath, you may find the pungent smell of the formalin objectionable, so prepare and use this bath somewhere which is very well ventilated.

Always make a point of following the maker's specific instructions when preparing solutions, taking particular care over the order you add the chemicals.

You should also be careful about handling the chemicals. Not all the chemicals used in colour processing are irritants or poisons, but many are, and appropriate precautions must be taken. Always wear good quality rubber gloves when handling colour chemicals. If possible, wear thin cotton gloves underneath to prevent sweating, and, after use, neutralize any deposits by soaking the gloves for a while in a straightforward stop bath. Gloves are particularly important if you use dish processing.

Temperature control

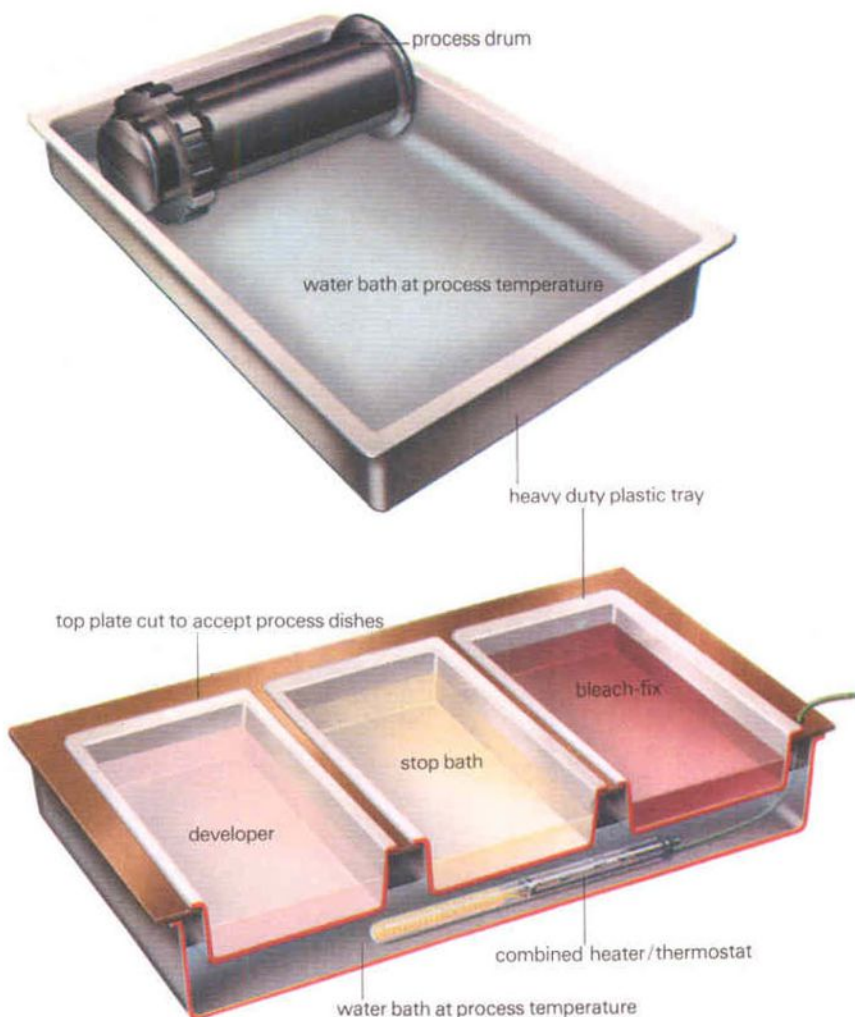
Accurate temperature control is essential when working with colour materials, particularly when you use high process temperatures for short development times. Keep the made-up solutions in a water bath until you are about to use

them. It is also worth keeping the drum in the water bath—some drums are designed especially to be used in a water bath. When using a drum in a water bath, you must remember to dry it carefully before you load it with paper or go anywhere near your prints with it.

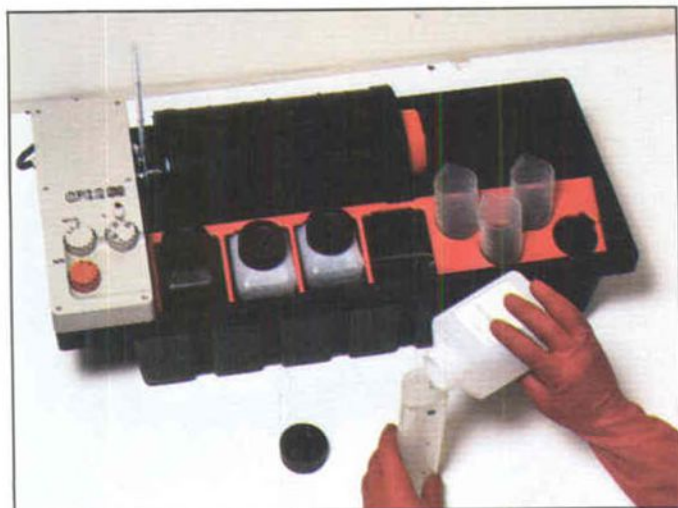
Although you normally have to control temperature very precisely, some modern processes are so quick that you can often dispense with elaborate temperature control and rely on simply *preheating* the drum in a warm water bath. Heat is then retained for long

enough for the process to be completed.

The idea is to heat the drum to a few degrees above the recommended processing temperature before starting. By the time the process is over, the temperature will have dropped to a little below the recommended processing temperature, but the average temperature for the process should have been right. Manufacturers give close guidelines for preheating techniques, but it is worth practising with water and old printing paper before you commit expensive chemicals and printing paper.



Verrier Artists



Jon Bouchier

Colour negative film

Although modern colour negative films are not as simple as black and white, they produce images in more or less the same way



Arthur-Bertrand/Explorer/Vision International

Negative and positive *The tones on a colour negative are reversed, as they are in black and white, but colours, too, appear as their opposites*

mixing blue, green and red, any colour can be divided into its blue, green and red components. By recording the amount of blue light, the amount of green light and the amount of red light reflected from a subject, you have, in effect, recorded the original colour of the subject.

So colour negative film is essentially based on three separate emulsions, one sensitive to blue light, one to green and the other to red. Because there are three layers, all coated together onto a base, such films are called *integral tripacks*.

The top layer is sensitive to blue light and ultraviolet light, and contains silver

bromide crystals, without any colour sensitization dyes. Because it is sensitive to ultraviolet light—to which our eyes are blind—this layer of the film receives too much exposure when the light is rich in ultraviolet. As a result pictures at the seaside and at high altitudes, where there is often more ultraviolet, may have a light blue cast and may look overexposed.

The second layer of emulsion is sensitive to both blue and green light. It is a silver bromide emulsion with certain colour sensitization dyes added (see page 534). This layer of the film must only record the green component of the subject, so blue light is filtered out by a yellow barrier layer between the first and second layers.

The yellow barrier layer is not made from dyes or pigments, but is coloured

Although colour film has only become widely popular in the last 20 or so years, the basic principles are almost as old as photography itself.

Colour negative film, and indeed all colour film, depends upon the discovery in the mid-19th century that coloured light can be split into three *primary colours*:

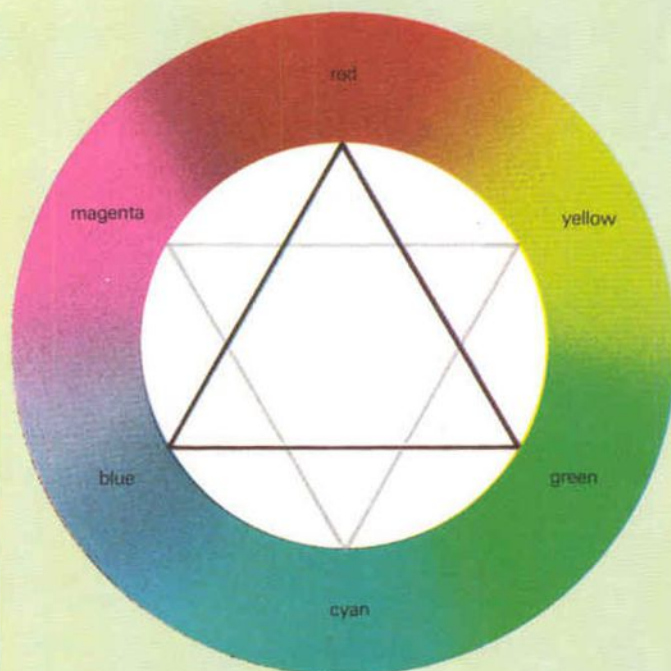
blue, green and red. If you project light of each of these three colours separately onto a screen, you can make white and almost any other colour in the spectrum (see page 198) by overlapping them in proportion.

Photographic scientists realized that this discovery might provide a basis for colour photography. Just as you can create any colour by

with finely divided silver particles—colloidal silver. Colloidal silver is used because it can be removed in processing by a bleach bath.

The final layer of the film, next to the film base, is sensitive to both blue light and to red light. Since the blue light has already been filtered out by the yellow barrier before it reaches this layer, it records only the red component of the subject.

The three emulsion layers, then, each form an image of one of the three primary colours, blue, green and red. Before processing, however, the film is not actually coloured. Colour must be provided by the formation of appropriately coloured dyes in each of the three emulsion layers during processing. The formation of the dyes is controlled by complex organic chemicals known as



Advertising Arts

Colour circle Colour negative film works by recording each of the primary colours as their complementaries. Printing the film reverses the process

colour couplers. Each of the three emulsion layers contains a different colour coupler.

When the film is processed, the developer reacts with the grains of silver in the emulsions to form a silver image just like a black and white negative, and also some by-products. It is the by-products that react with the colour couplers to form the dyes that make the colour image.

Round each grain of silver in the blue sensitive layer, for example, yellow dye is formed, and a yellow image appears. The same process happens in the other layers. Where green light has struck the green sensitive layer, a magenta image is formed, and where red light has struck the red sensitive layer, a cyan (blue-green) image is formed.

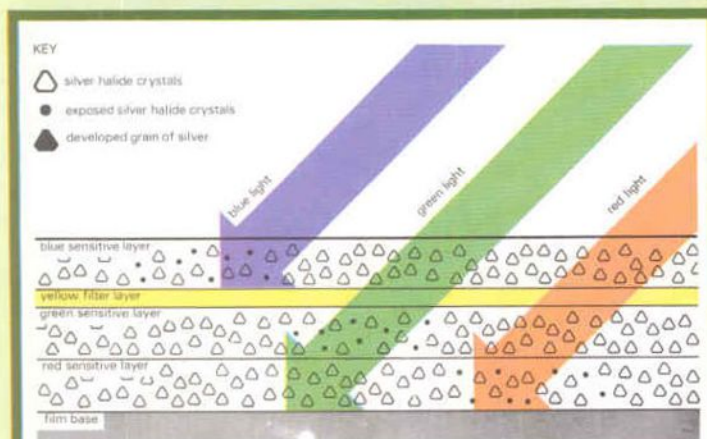
After colour development, then, there is both a dye image, and a silver image in each emulsion layer. It is difficult to see the colours of the dyes because the black and grey tones of the silver hide them. To convert the negative into the right form the silver image must be bleached away. The bleach used is not ordinary household bleach, but a chemical which converts silver back into silver bromide, without affecting the dye images in each layer. It also bleaches out the yellow filter layer.

After bleaching, the film is immersed in a fixing bath, which makes all the silver bromide soluble in water. This process is similar to the fixing of a black and white film, but the fixer is formulated so as not to affect the dye image.

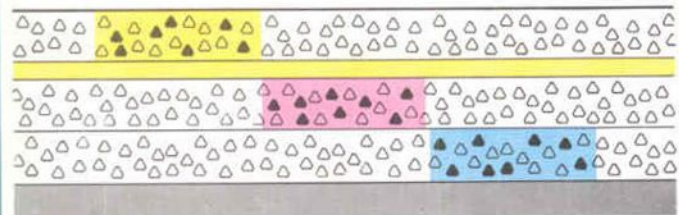
Finally the film is washed to remove all the soluble compounds, and hung up to dry. The bleach and fixing stages are often combined into one—a 'blix' bath—and the processing routine is no more difficult and only a little longer than developing a black and white film.

A negative image

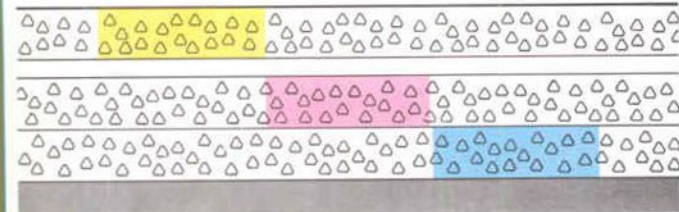
A colour negative is negative in two senses. Not only are light tones in the subject reproduced as dark in the negative, but all colours in the subject are reproduced as their complementaries in the negative. All these primary colours, which are mixed to form other colours, are rendered as their three complementary colours: blue becomes yellow, green is changed to magenta, and red becomes cyan. Just as the printing of a black and white negative gives the image its original values, so too does the printing of a colour negative. Colour printing paper works in a similar way to film and the print is simply a negative image of the negative—a 'positive'.



Exposure Exposure to blue, green and red light forms a latent image in the three emulsion layers, each of which is sensitive to one of the primary colours



Development A silver image is produced in the layers of the film where light of the appropriate colours fell. Colour couplers react to form coloured dyes



Bleaching A bleach bath converts the metallic silver back into silver halides, and removes the yellow filter layer



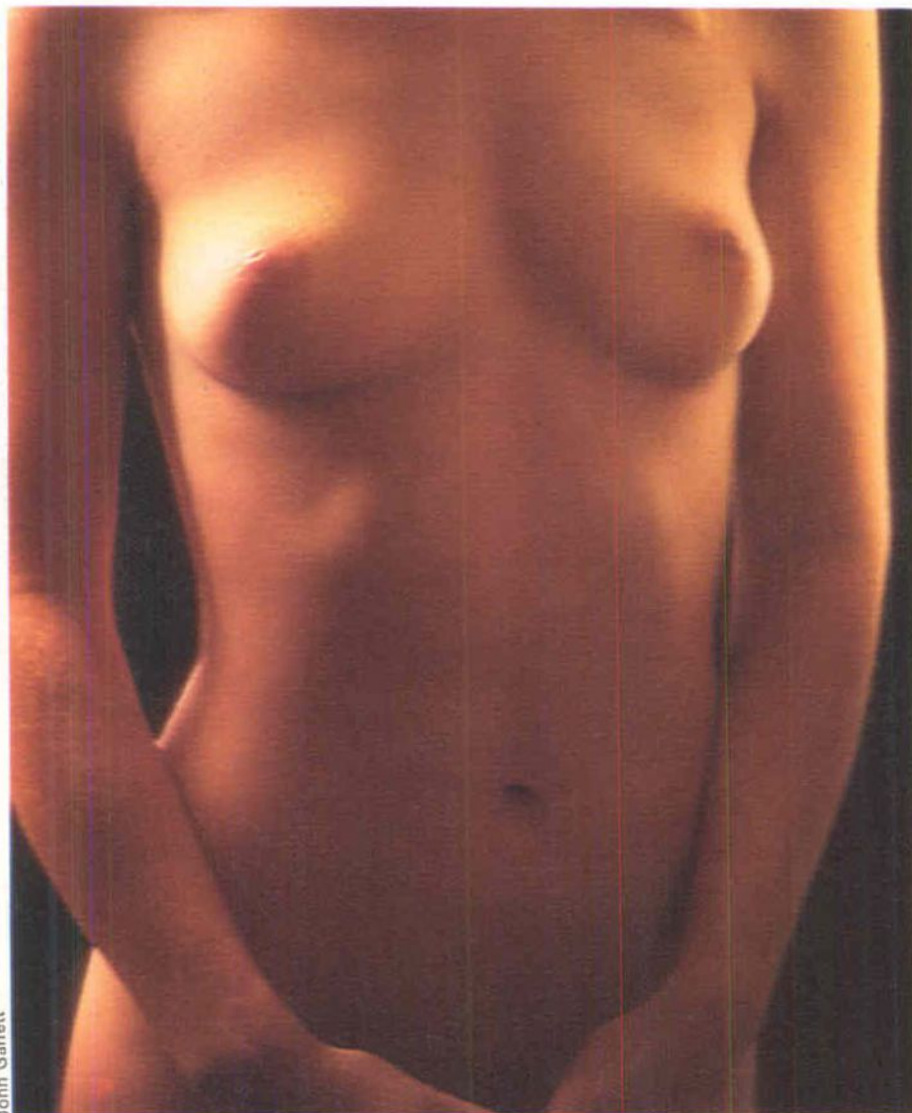
Fixation The silver halides are removed from the film in the fixing bath, leaving only dye images in each layer, in complementary colours of the light that struck the film



Creative approach

Nudes by artificial light

The naked human form is an ideal subject for stretching your photographic imagination—more so if you use artificial light indoors to open up new possibilities



John Garrett

Natural light is kind to the human body. It suits skin tones and textures, flattering the subject and often giving a fresh, unposed appearance. Its drawback, of course, is that it is to a great extent uncontrollable. Artificial light, on the other hand, gives the photographer the ability to control the light falling on the subject to a precise degree. With skill, accurate imitations of natural light can be achieved, but so can dramatic or startling effects.

As a subject the nude, particularly, can be given great erotic or expressive

power by careful use of artificial light. The nude form can be presented as a fantasy object, as an abstract shape, as an object of idealized beauty, as a study of textures, or even as an examination of the human condition itself.

Lighting principles

Despite the obvious advantages of photographing the nude—whether female or male—with artificial light, many people approach the subject with some trepidation. Many of the great nude photo-

graphs have indeed used natural light, but there are, of course, glorious exceptions—the work of Brassai in the brothels of Paris in the 1930s, the studio nudes of Bill Brandt, the work of the famous German fashion photographer, Erwin Blumenfeld. All of these examples, together with the many modern photographers working with this subject, show just what can be achieved. Nor should you be put off by the mistaken idea that highly complex, expensive lighting will be needed—even a candle can suffice in the right circumstances.

Even with only a single light, it is possible to duplicate the effects of a natural light fairly accurately. And once the effects of a single light source have been explored, you will find that by adding other lights the degree of control over the final image can be very fine. Most natural light photographs indoors—not only of the nude but portraits and still-lives too—rely to a greater or lesser extent on daylight from a single source. This means that the relationship between subject and light source is relatively fixed, and new effects can only be achieved by moving the subject and the camera. Artificial lighting changes this, and once you have a basic camera position it is possible to alter the lighting effects quite dramatically by moving the light sources, perhaps adding extra lights or taking some away.

Bear in mind that the human body is a collection of round shapes. If it is lit from the front, these round shapes will be flattened. Lighting will be more

Golden girl *This simple, classic pose is enhanced by the warm colouring produced by the use of a gold reflector together with an 81C filter*

Laughter *A natural atmosphere is much easier to capture in a home setting. The gentle, diffused lighting comes simply from domestic spotlights*



Tapdance

successful from the side or from above. Before subjecting the model to lengthy and probably cold experiments with your lighting equipment, study the effect of changes in lighting on an inanimate object, remembering that most skin has a high reflective quality. You will soon see that a single light source will cast hard-edged shadows, and that the addition of a white reflecting screen, or a secondary light source diffused with a translucent cover, will open up the darker areas of shadow and will be more complementary to the skin tones.

Try taking the diffuser off the second light source and watch how the shadows change. Circle the lights around each other and look at the effects of cross-lighting. This will give simple demonstrations of how it is possible to over-light the subject, running the risk of destroying the mood; which is easily done even with a simple arrangement of a main and secondary light source. As soon as two main lights illuminate the same space, the shadows they cast become ugly and confusing.

The lighting should suit the type of model—perhaps strong lighting could be used for a sexy personality and softer light for more sensitive, feminine subjects. You should also remember that, whereas female nudes are usually lit to enhance curves, males should be lit to give a strong sculptural emphasis. Baby oil can be applied to make the skin glow and to accentuate form.

The most important factor is the relationship of the subject to the main light, but once you have established this, you must decide what additional light sources produce the effect you want.

If you are lucky enough to have a patient model, and enough lights to experiment widely, see what additional subtleties can be added with high-lights. Making sure that you do not interfere with your main sources and create unpleasant shadows, try adding



Caroline Arber

Candlelight In this study of a male nude the main source of light comes from the wall-lamp, but the additional candles at the sides fill in the otherwise dark areas with a soft, warm light which is complimentary to skin tones

a highlight to the subject's hair from above, or above and to the side. Moving this light nearer to the floor, you can achieve a backlighting effect, which can also be effective and flattering when photographing a woman.

A decision also has to be taken about the type of background to include.

Imagine a photograph of a nude against a textured wall—perhaps peeling wallpaper or flaking paint. This juxtaposition of subject and background suggests to the viewer the photographer's attitude towards the subject. Now consider exactly the same photograph taken with a black drape covering the wall, so that there are not even shadows on the background to intrude into the shot. The focus of attention is on the model and the mood of the photograph no longer depends on the difference in texture between flesh and wall, even though in both cases the background may be identically lit.

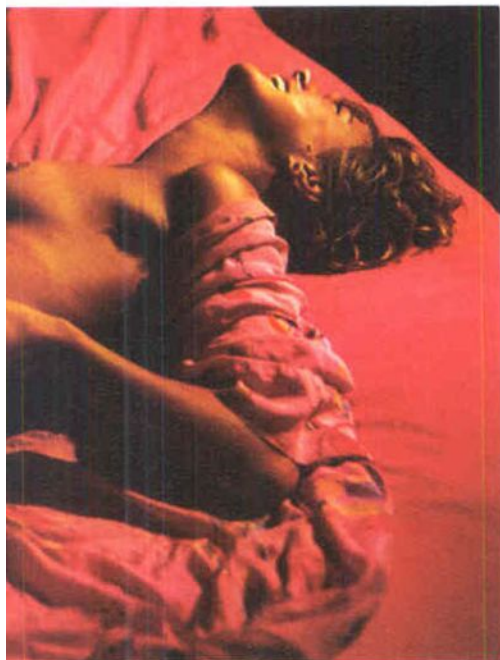
Again, the proximity of the model to a particular background alters entirely the

feel of the picture. Thinking again of the textured wall, a model placed directly against it will result in a photograph which comments on the difference between these two textures. If you move the model away from the wall, so that the fine detail of the skin can be seen but not that of the plaster and paint, the effect will not be of juxtaposing textures so much as a study of different shapes and patterns—the way the light falls on the subject, its shadow falling on the background, a body existing in a particular environment that you have chosen.

The inclusion of another object in the photograph, an ornament, painting or piece of furniture can also add interest to the picture. If you have time, light the object carefully, relating it in some way to the main subject. Remember that each can cast shadows which may be used to create a study in patterns.

First steps

The first rule when approaching a new photographic discipline is not to be over-



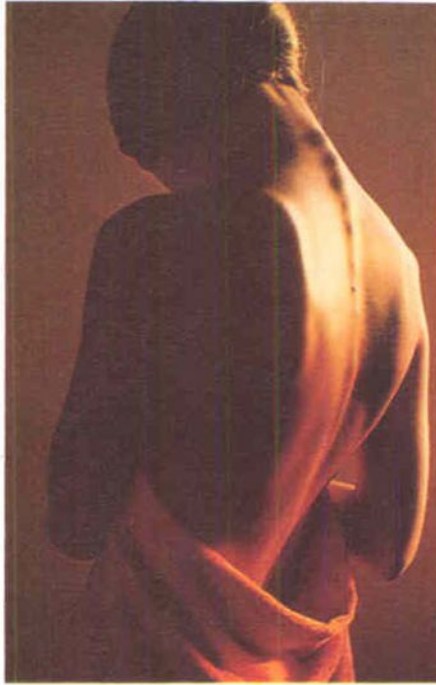


Girl on white *The strong diagonal line breaks the rectangle of the picture shape, making a dramatic composition. Skilful lighting reveals skin texture*

ambitious. It is sensible to have a plan of what you hope to achieve, but only too often the initial results are so disappointing that frustration with technicalities intrudes between you and that wonderful image you have in your mind's eye. So, start by expecting very little, in the knowledge that by following simple procedures, you may be pleasantly surprised, and at best excited, by the results you can achieve.

Assuming you have a willing model, try starting with the simplest and in some ways the most exciting source of illumination available—candle power. Set your camera on a tripod, preferably using a standard or slightly long-focus lens (on 35 mm format a 50 mm lens or 105 mm lens may be ideal). Make sure your model is in a comfortable position, perhaps sitting at a table, light a candle, switch out the light and begin to look through the viewfinder.

Remembering that you have not only a model to position, but also a light. Gently move both subject and light source around. See how the candle, placed slightly below the camera, but between subject and lens, can illuminate face, hair, chest and arms. Now shoot a few pictures, varying your exposure. Try making exposures of a few seconds,



David Hamilton/Image Bank

Toplight *The curve of the back is echoed by the folds of material and emphasised by the bent head. A light from above picks out the line of the backbone*

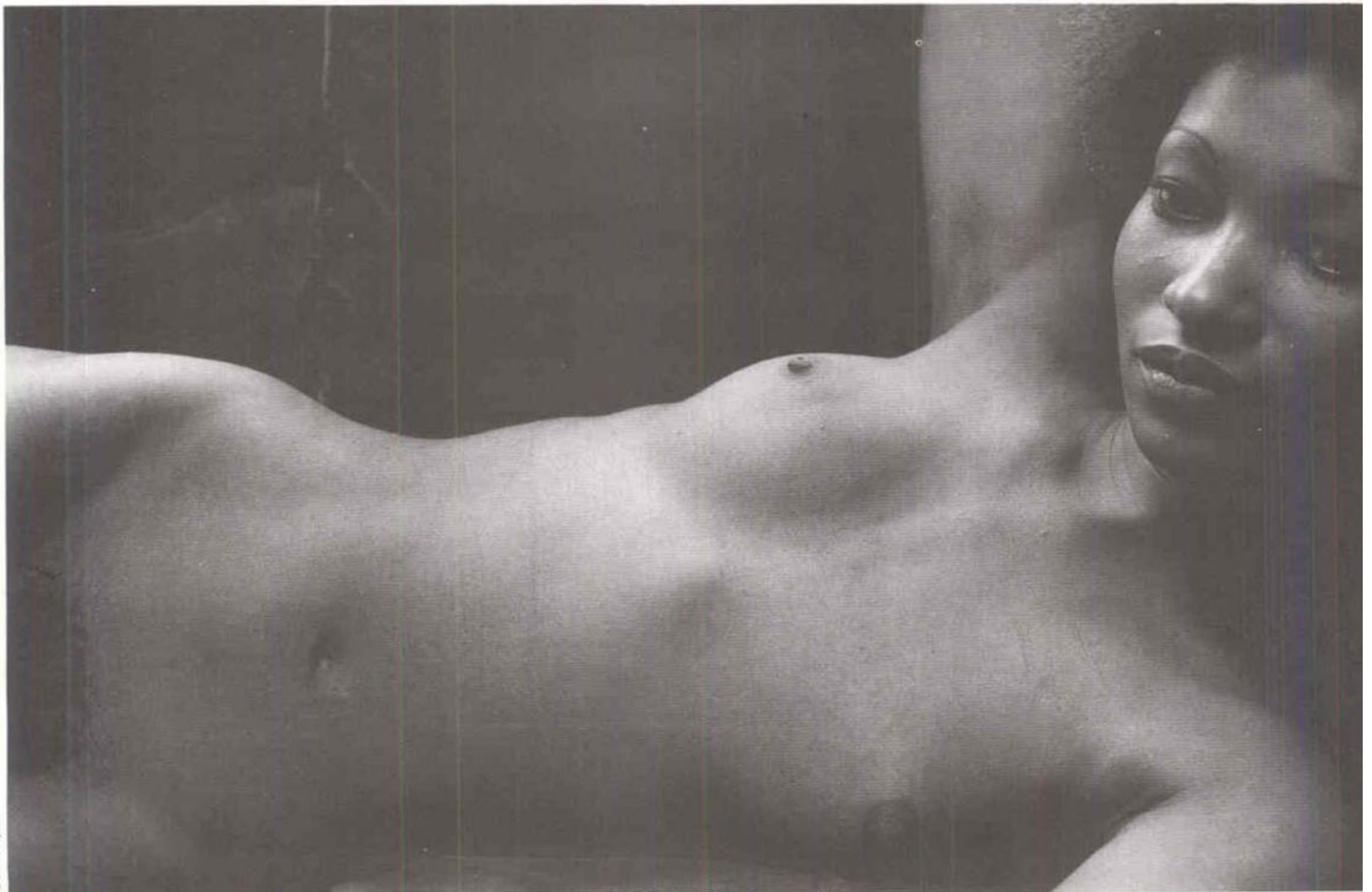
Black beauty *Framing the body closely, the photographer has lit the model from above and behind with a large, diffused light source which reveals body line*

or even longer, depending on the subject distance and the speed of the film.

Move the camera in closer, concentrate on details of the body and the different textures of skin, eyes, lips and hair. See how you can use the candlelight to throw back mysterious reflections from the eyes and sheen from the hair. Having an assistant to move the candle around will be of great help. Shoot perhaps 12 or 15 pictures, then take a break and switch on the room light. See how the strange shadows cast by the candlelight, the deep blacks and strong highlights, vanish when you introduce another light source.

Assuming that you have an overhead domestic light, try covering the shade with black cloth or paper, so the full light is directed downwards. Sit your subject directly under the lamp and see the way the light casts grotesque shadows over the face and body. Shoot some more pictures, again being careful to try several exposures.

Now introduce another lamp. This can again be domestic, but the use of photo-flood bulbs makes for a stronger and more dramatic effect. Move this light around, illuminating from one side, then directly in front. Keep the overhead lamp in operation, and see how its effect is diminished by the introduction of the other light source. By now you should have used up at least two rolls, so it may be a good idea to process the film to check the results. These simple oper-



Paul Joyce

ations will form the basis for understanding what happens when you introduce more sophisticated and complex light sources to your chosen subject.

Next you should introduce other light sources into your nude photography. Again, these need not be complicated—two or three lamps on tripods. If you want to create the impression of a strong 'key' light, as from a window, a diffusing screen should be placed in front of the brightest lamp. This can be made simply from a square wooden frame containing translucent plastic or tracing paper.

When you work with two or three lamps and reflectors in a limited space, you need to pay attention to the background. In a commercial studio, there may be large rolls of different coloured paper, strung from the ceiling and pulled down to floor level as and when required. This is not too difficult to arrange at home, the chief expense being the paper itself. But good alternatives would be a coloured sheet or blanket, and for a touch of class you could use a velvet curtain. One well known photographer regularly raids his local market for old pieces of material.

So, assuming that you have placed your model in front of your chosen background, you can begin to move the

lamps around for the effect that appeals to you most. Try first with a single light source, direct to begin with and then diffused. Notice how the direct light etches a strong highlight as it strikes the flesh, while the rest of the body disappears into the deepest shadow.

Next place a second light on the other side of your subject. Now you have two highlights, and a dark central area. This calls for careful use of the screens. Angle the screens so that light does not 'spill' away from the subject, but is reflected back to the areas of flesh not

Male nude Choosing one particular part of the body only, the photographer has used selective focusing to concentrate on the quality of skin and chest hair

covered by direct light. With two lights, one diffuser and, say, three screens you are in complete control of the representation of your subject. Remember, always have consideration for your subject. She or he may by now want to stretch or change position.

While mixing light sources is perfectly acceptable in black and white, in colour photography a new factor is involved—colour temperature. The colour of a light source at a high colour temperature is bluish, but at a low one it is nearer to the yellow and red end of the spectrum. Basically, your light source must be matched with the appropriate colour film. So 'daylight' type film would also be suitable for use with blue flashcubes or electronic flash, whereas type B films would be used for artificial light sources such as photographic lamps and photofloods.

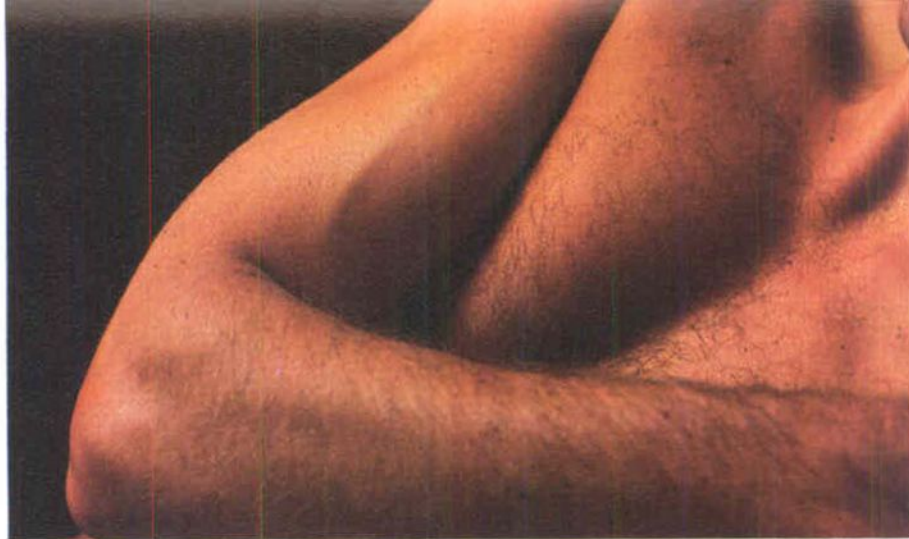
Shooting a nude in colour presents a whole new range of problems, not all of them technical. Our notion of what constitutes 'conventional' good looks is subject to much more careful scrutiny. Not only are skin, hair and complexion colour important to the composition of your picture, the colours and the type of background must be carefully chosen too. Colour is much more directly involving—with the personality of the subject and the erotic implications more likely to assert themselves in the image. Used creatively colour offers the scope for really superb images of the nude.

Black and white allows you more distance from your subject, permitting an almost 'objective' examination of the body in question, observing it almost as if it were a miniature landscape.

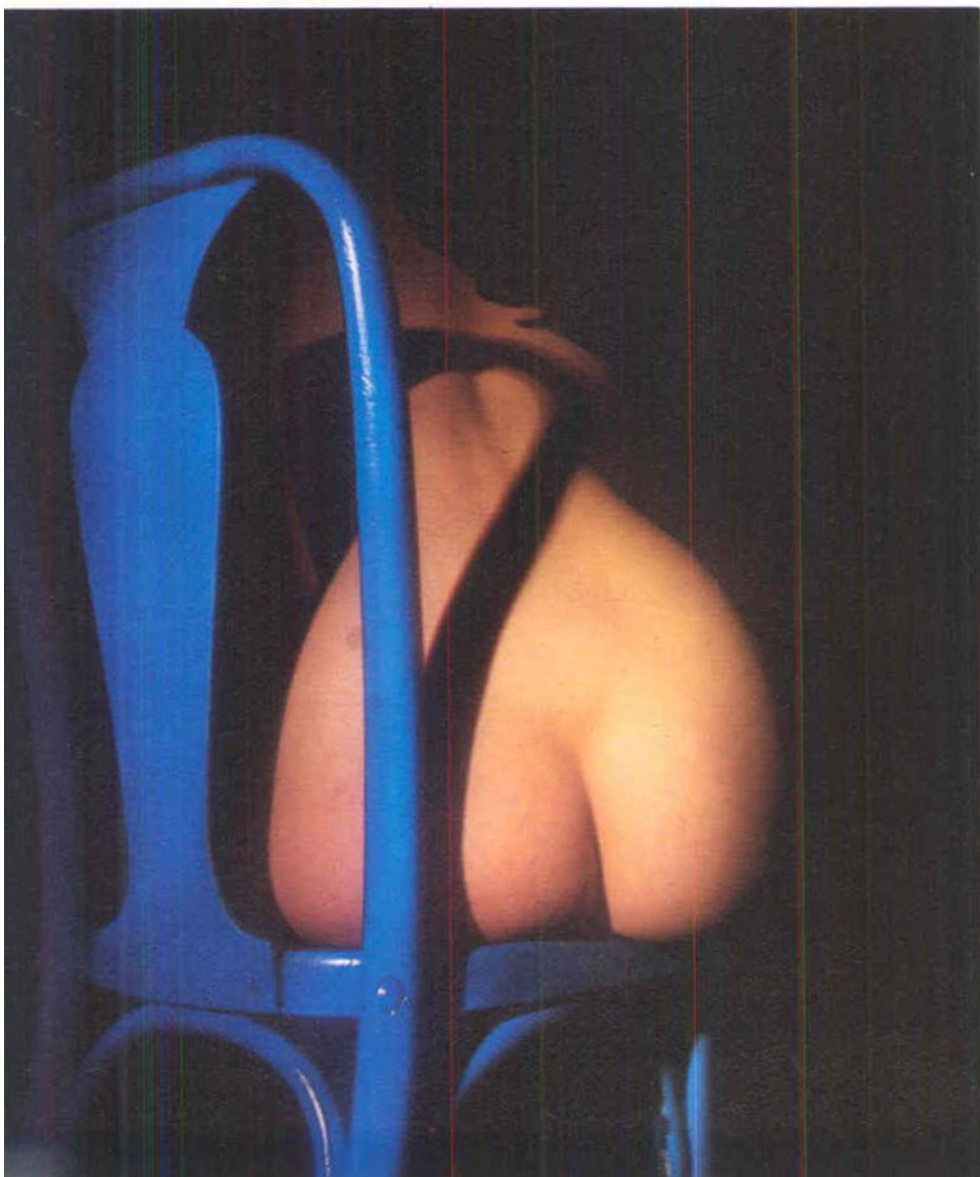
The male nude

The female nude is a subject that has been photographed extensively, and the range of poses that look 'natural' is well

Blue chair The sharp blue contrasts strongly with the pale skin, and a cast shadow echoes the body shape. Jelly smeared on the lens gives soft focus



Michael Busselle



Simon de Courcy Wheeler



Lee Higham

Huntress An art deco statue was the inspiration for this pose. Strong key lighting was used from above, and a snoot picks out the facial detail

Shoes Finding your model something to do as you photograph, particularly in a formal studio setting, will help achieve a more natural pose



established. For the male nude, however, there is much less agreement about which poses are effective. A man copying a standard female glamour pose frequently looks downright laughable, simply because that type of pose fits our stereotyped notions of the female role. For similar reasons, male photographers will shy away from photographing the male nude. As a result, one is presented with the rare opportunity to explore a field that is virtually untouched.

When photographing a male nude, therefore, the photographer must consider even more than usual what the photograph is trying to achieve. Because of the lack of standard photographic images, it would be worthwhile looking at the approach taken by classical painters and sculptors, who often managed to portray the male nude without excessive eroticism or coyness. It may well be that suitable poses for males will be more active than those for females.

This introduction to the problems, as well as the rewards of nude photography should encourage you to think and experiment. Once you have absorbed the basic rules, experiment, and start doing what your imagination tells you is right—few of the great nude photographs would earn a place in a standard technical manual. But always remember to respect your model—make sure he or she is comfortable. If the room is cold provide a heater before you see the goosepimples through your lens. And always take the trouble to give an unpaid model some sample pictures in gratitude for what is frequently a silently suffered, traumatic experience.

Michael Busselle



Assignment

A mountain walk

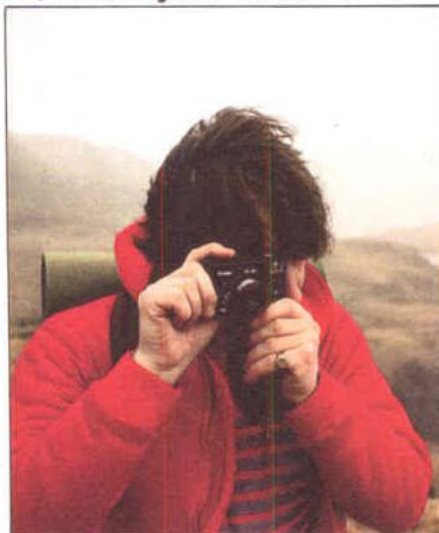
On assignment in a mountainous area during terrible weather, photographer Julian Calder took only the bare minimum of equipment to record the event. His pictures, taken with a compact 35 mm camera, show just what can be done

Upland areas, hills, mountains and moorland are almost invariably attractive and scenic and, therefore, ideal sources of picture material. Also, many people find great pleasure in hill walking, climbing or just wandering around in such places, so what could be better than to take off on an assignment to combine the dual pleasures of walking and photography?

Our assignment involved Julian Calder and friends travelling to the Scafell region of England's Lake District to discover just what the area had to offer.

The aim was to see how such an area could be dealt with photographically using the sort of equipment that many people would probably find themselves carrying.

Julian's choice of camera was a pocket-sized compact 35 mm rangefinder type—a Rollei 35SE. Using a camera like this is very different to a complete 35 mm SLR system. Instead of thinking about extra lenses and a multitude of accessories,



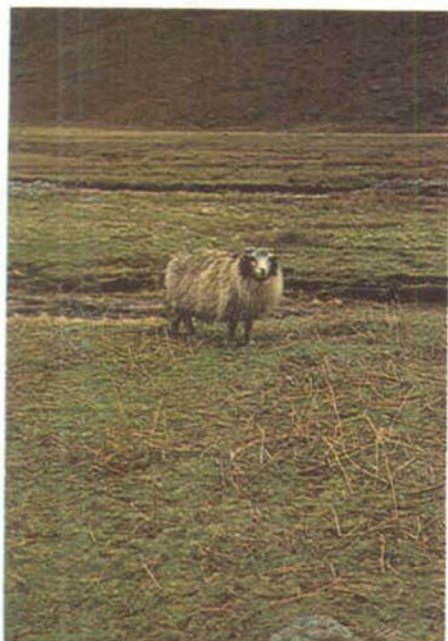
John Heselaine

The man and his camera In spite of its diminutive size, Julian found that the controls of the Rollei were easy to use

you simply concentrate on what you see in the viewfinder. And this should leave plenty of time for careful framing up. Without coupled rangefinder focusing, the subject-to-camera distance has to be estimated. If you are more concerned with taking long distance landscape shots this is less important.

Julian wanted to convey something of the atmosphere of the walk itself rather than just making a pictorial record of the landscape in passing. For this reason he looked for opportunities arising from candid situations. This seemed particularly appropriate given the atrocious weather conditions over the two day assignment—the bright splashes of colour of the walkers' clothing nicely offset the drab, misty background.

After becoming familiar with the rather limited choice of subject, Julian found himself concentrating on taking different approaches to what he came across—particularly with regard to choosing his viewpoint very carefully.



Solitary sheep The facility for fitting a telephoto lens would have been useful for this shot. The image is sharp even though full aperture was used

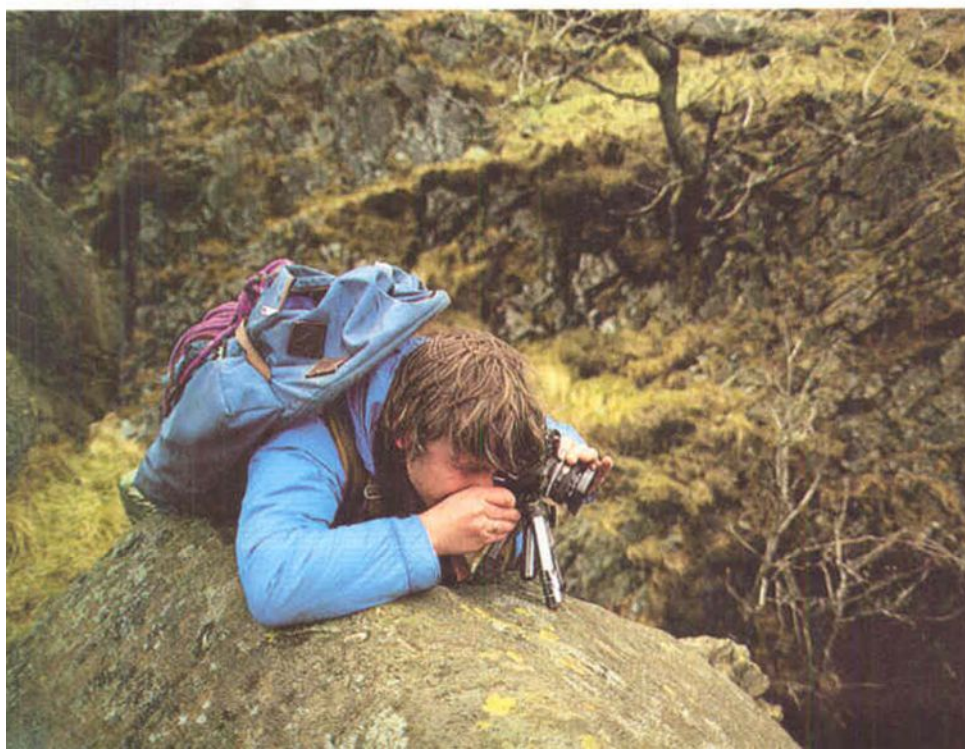
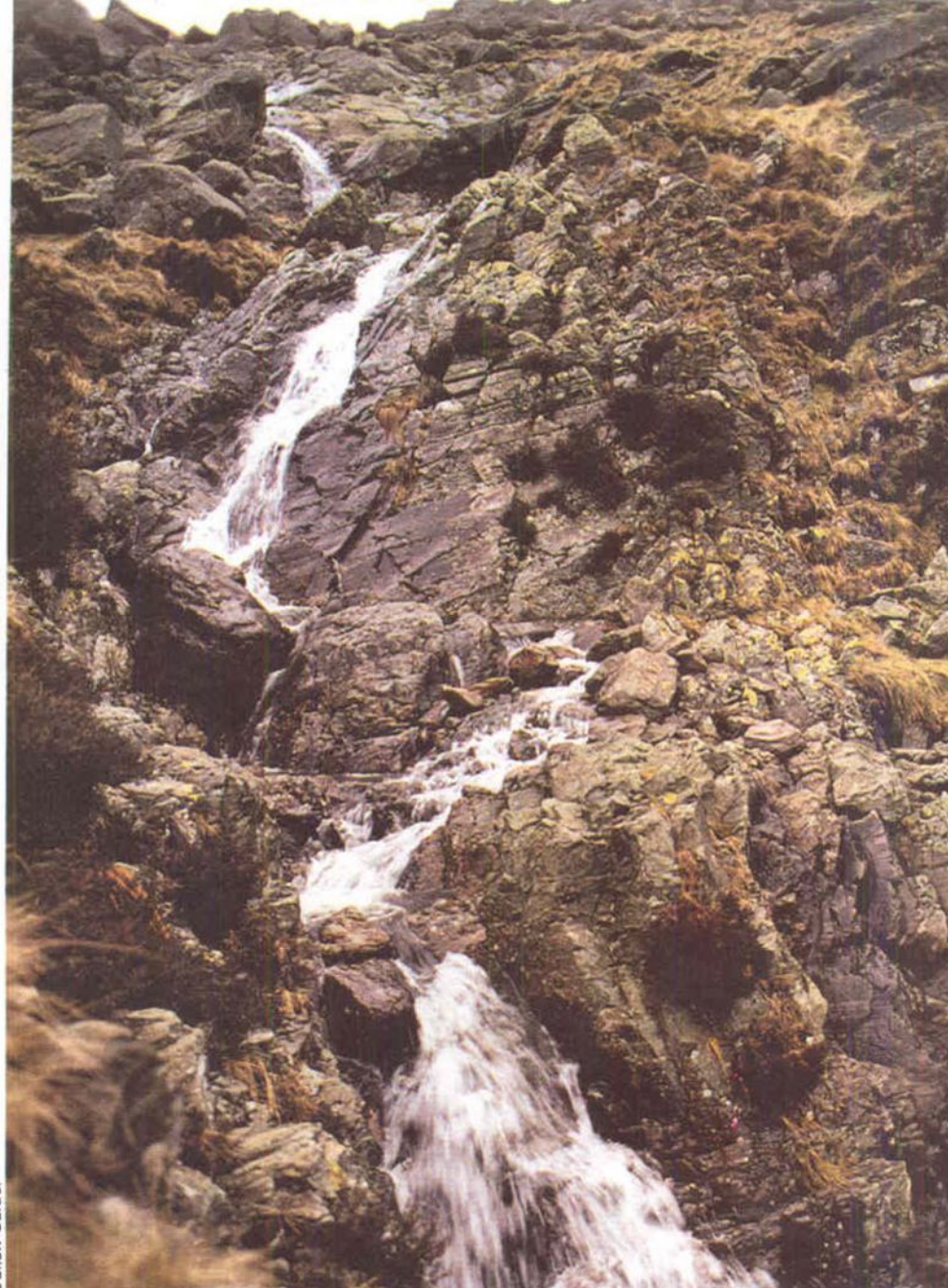
Scenic vista The mist lifted for a while and Julian used the Rollei for a shot of the attractive landscape. Ektachrome 64 was used for all of these photographs

Waterfall Using the creative flexibility of the fully manual exposure control offered by the Rollei, Julian avoided freezing the movement of the water

Crossing the next bridge Having the Rollei close at hand meant that it was always ready for recording various stages of the hike

Rock steady One of the other hikers took along an SLR camera and accessories including a miniature tripod which proved useful for shots in the low light

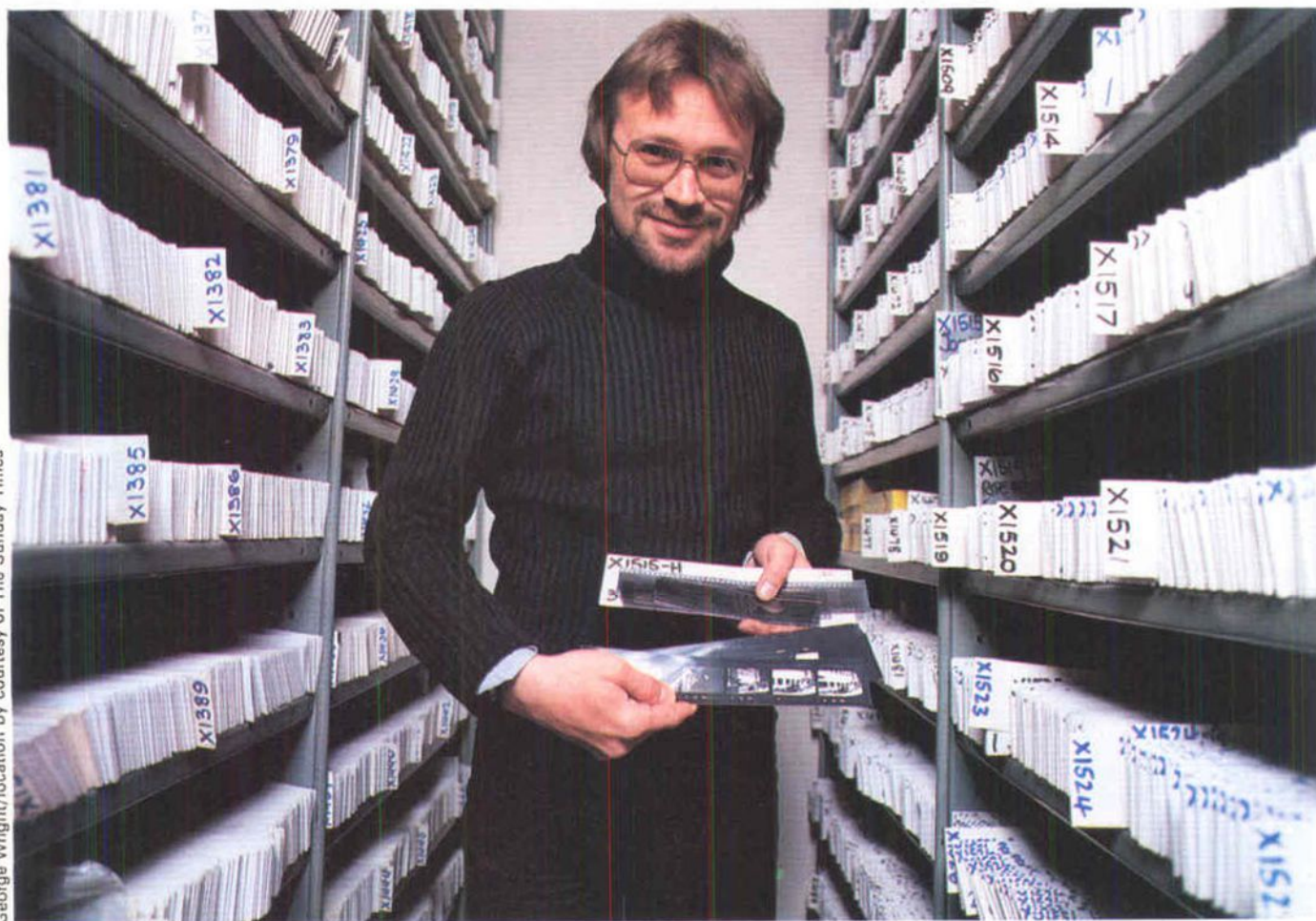
Julian Calder





Storing slides and negatives

Trying to find haphazardly stored slides and negatives can be frustrating and time consuming, but an organized storage system makes it easier to find a particular image and prolongs the life of film



George Wright/location by courtesy of The Sunday Times

Picture storage is a surprisingly neglected aspect of photography. After investing considerable thought and expensive photographic materials, many photographers tend to drop their pictures haphazardly into a shoebox and forget them for a couple of years.

It is an optimistic approach, to say the least. Looking for a particular picture some years on could involve searching laboriously through hundreds of slides or negatives and even if you do find it, it may well be damaged or simply have faded. Yet with a little care and attention,

pictures can be stored so that they are readily accessible and last for many years. Nobody knows exactly how long the images on film do last. A poorly treated colour negative may begin to fade after only a few years but in the right conditions, a film could last 100 years with little deterioration.

Museums and scientific establishments want to preserve photographs perfectly for posterity and may go to considerable lengths to achieve 'archival permanence'. Although you probably do not want to take storage quite as seriously as

the museums, avoiding a few basic hazards may prolong the life of your pictures long enough for your grandchildren to show their grandchildren.

Causes of film damage

The biggest danger to film is, ironically, the photographer's hands. Human hands carry grit and dirt, are usually moist and slightly greasy, and frequently carry bacteria and fungus that quite literally eat away the gelatin of the film. The most important consideration is that the film should be handled as little as possible.



Newspaper pictures Most large newspapers store their slides and negatives with great care, so a picture can be located at a moment's notice. In this one, small proof prints are kept in subject order (above) and a reference on the print leads either to rows of negatives, stored with contact sheets (left) or to sheets of transparencies, which are kept in indexed cardboard boxes (below). The whole room is kept at a constant temperature and humidity, and sliding storage racks save space

A humid environment can also quickly damage the film because the gelatin that supports the image on the film is *hygroscopic*—it takes up moisture from the atmosphere at an alarming rate. This allows other harmful chemicals to penetrate the emulsion more easily.

Dust and grit are further obvious dangers, and are probably the most common cause of damage to badly stored photographs. With slides or negatives stored in a disordered pile, small particles of grit can easily scratch the film surface. Static electricity attracts

dirt and should be kept to minimum—brush any dirt off film using an anti-static brush.

A less obvious problem is that presented by bacteria and fungi which, in the right circumstances, can grow on the film, feeding on the layer of gelatin and obliterating the image.

Paper, cardboard, wood, paint, rubber, certain plastics and some glues can also give off acidic vapours that are harmful to film.

Although moderately high temperatures do not actually damage processed film, they speed up the action of all the other dangers to the image. The colder that a film is kept, the longer the images will last without change, and when permanence is essential film is held in a cold store under controlled humidity.

Light, however, though not really a threat to black and white negatives, can rapidly damage colour slides and negatives. The worst types of light are blue light and ultra-violet. Although there are considerable blue and ultra-violet components in both sunlight and fluorescent light, ordinary light bulbs give out relatively little and are therefore harmless to colour film. Ideally, though, all colour film should be stored in the dark.

Storing negatives

The most important consideration for any storage system is access—there is no point in having negatives which last forever if you cannot find the one you want to print.

It is worth making a contact sheet (see page 205) of every film if you can. This not only prevents you handling valuable negatives unnecessarily. It also makes finding a particular photograph easier since you can flick through the contact sheets rather than looking at every negative individually.

Many photographers store negatives in translucent paper envelopes, often called *glassine sleeves*. Glassine sleeves hold strips of six negatives, and allow you to look at the strip without removing it from the sleeve. *Negative file sheets*, however, hold six or seven strips of negatives and allow you to keep a whole film in one place. They usually have holes punched down one side so that they can be stored in a ring-binder and kept in order.

Negative sheets with one, or both sides made of clear plastic are becoming increasingly popular. Clear plastic allows the film to be contact printed without removing it from the sheet. While this eliminates the danger of damage while the negatives are removed, it does mean that contact sheets must be made on larger pieces of print paper: usually 30 x 25 cm instead of 20 x 25 cm. An additional problem is that some transparent plastic materials give off vapours which can damage the negative image in the course of time. Check with your dealer when buying negative sheets that they do not damage the film in this way. Polythene is thought to be safe, but PVC gives off harmful vapour.



George Wright/location by courtesy of The Sunday Times

Many photographers attach the contact sheet to the negative file sheet, then store them both in a ring file. Although this is convenient, it does mean that the negatives are disturbed when you search through the contact sheets, and it is better to number or date the contact sheets and the negative sheet. The two sheets can then be stored separately.

Whatever kind of sleeves you use, the negatives should be stored in the dry condition. Few amateurs can afford to buy a special film desiccator, which ensures that films are kept dry, but a large biscuit tin or some other airtight container can serve to keep out most moisture. In very humid weather, a bag of silica gel crystals dropped into the tin should remove any trace of dampness from the atmosphere inside. Some types of silica gel crystals change colour when they are saturated with water, and should then be removed and dried out in the oven. These simple precautions can prolong the life of any negatives, but are particularly worthwhile with colour film.

Storing slides

The dangers to colour slide film are very much the same as those to negative film, and the same steps must be taken to safeguard them. Fortunately, however, the images on transparency film are more stable than those on negative film and correct storage is much less crucial. If transparencies are stored in the dark in a reasonably dry place, they should last for at least 50 years before they begin to fade significantly. Negatives may last less than half this time under similar conditions. However, both slides and negatives deteriorate far more quickly if they are stored in a humid atmosphere.

Slides are less likely to be damaged when they are properly mounted, particularly if the surface of the film is protected by glass. Although many processors mount slides for you, it can be worth mounting slides in glass carriers yourself—slide mounting is the subject of a subsequent article.

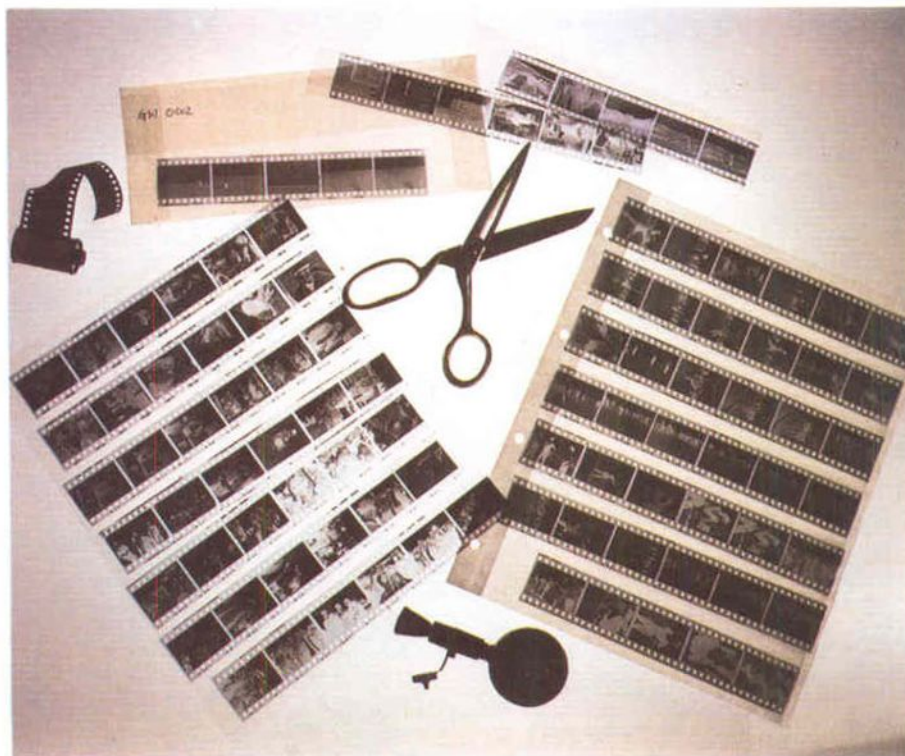
Unmounted slides can be stored in exactly the same way as negatives, but mounted slides present different problems. Leaving slides in the boxes in which they are returned from the processor is not a very satisfactory solution, as it means taking each slide from the box individually to look at it. Clear plastic transparency display sheets make life much easier. These have rows of pockets 5×5 cm—the size of a mounted 35 mm slide—each of which holds one transparency. Each sheet normally holds 36

Faded fifties fashion *Old colour slides clearly show the effects of bad storage. One colour has faded faster than the others, resulting in a colour shift*

Storing negatives *File sheets can be kept in a ring binder, and clear plastic types (left) allow contact printing without removing the negatives*



Barnaby's Picture Library



George Wright



Slide storage Translucent storage sheets like these make it easy to find a particular image, and can be stored in a ring file or filing cabinet

File boxes If you have a lot of transparencies, then a storage box may be a better solution. These hold slides either individually, or in magazines

transparencies, though larger and smaller sizes are available.

There are many different makes of display sheet on the market. Some are clear at the front but translucent at the back, so that light falling on the back of the pack is diffused. This means that you can see the slides against any reasonably bright light. Many display sheets also have a cover flap that keeps dirt out, and a slot to take a bar for hanging the sheet in a filing cabinet.

A slide storage and display system much favoured by professional photographers consists of sheets made from thick black card, punched with holes the size of a 35 mm slide. On the back of the sheets there are small slots into which the slides can be placed, and the apertures on the front of the card allow the slides to be seen. Tiny black masks cover the slide mounts, so that all that is visible is the image itself. This makes it easier to look at slides because excess light around the slide is completely cut out. These card sheets are, however, several times more expensive than ordinary plastic sheets.

If you have very large numbers of slides, the cheapest way of storing them is probably to use a specially designed box or cabinet. These have rows of drawers, with individual slots for each slide. They range in capacity from 100 slides upwards, and the largest cabinets



George Wright/storage cases courtesy of ROWI

are purpose built—they can be made to accommodate many thousands of slides.

Locating a particular slide in a storage drawer can be difficult, so each slot is often numbered, and a numbered key sheet is printed onto the lid. This is fine as long as you do not change the contents of the drawer too often. If you do, it is probably better to keep a separate record, or use cardboard tabs as markers, dividing slides in each row into separate subject categories. Some files are made particularly for this kind of system.

Other storage systems hold complete magazines of the straight, rectangular type ready for loading into a slide projector. If you have a projector that takes

straight magazines, you can make up magazines for small slide shows. When you want to show the slides, you need take out only the magazine you want.

If you use a rotary projector, you may find that storage of slides in projector magazines very expensive, because the cost of each magazine is quite considerable. You can store the slides in special transfer trays which hold them in a similar pattern, but are very much cheaper than the magazines.

The best location

It is not enough to simply store your photographs in an airtight container, you should also try to keep the container away from any sources of direct heat, such as radiators or boilers. Direct sunlight can also be very hot, so try and avoid keeping your photographs anywhere near a window. Attics are another potential heat trap during the hot summer months.

Anywhere that is likely to be damp, such as garages or basements, should be avoided. Beware, too, of fresh paintwork and varnish, since these substances and certain glues give off harmful vapours.

For absolute permanence photo-

graphs should be frozen, and if you have films which you look at rarely but you value a great deal—such as wedding negatives—then you should seriously consider freezing them. If you do freeze any films, however, you must be very careful to stop any condensation. Ordinary freezer bags do not keep out moisture completely and you must buy special foil and polythene envelopes. These act as an airtight barrier when sealed with a hot iron.

For all the rest of your photographs, however, there is no need to go to such lengths. If you store your film in an airtight container in a cool, dark, dry place, there is no reason why it should not outlive you!



Early war photographers

Pictures taken by early war photographers of fields of battle all over the world have left us important historical records of the realities of nineteenth century warfare

In 1859 an unknown English amateur photographer, known now only as 'JL' was touring Switzerland with his wet plate camera when 'the exciting prospect of being able to get plates of battlefields, sieges and other incidental scenes' drew him south to the Austro-Italian War. 'I should not like to miss the opportunity of getting a photograph of a field of battle', he wrote, 'so that when the excitement of the conflict is past they might not talk so flippantly of war.'

Though none of JL's photographs have survived to tell whether he succeeded, this view of the role of the war photographer must be familiar to modern readers, used to the realism brought to the news coverage of wars during the conflict in Vietnam. But in the 19th century, this attitude was unusual. Few early photographs seem to convey the full horror of war. They seem to the modern eye stilted, posed and unreal.

Though the lack of realism undoubtedly owes much to the technical limitations of early cameras and photographic processes, it was often deliberate. Many of the early war photographs were commissioned from government departments, sometimes for information, sometimes for the historical record, but more usually for propaganda—to show how well the war was



Yale University Library

The first war photograph General John Wool and his staff ride through the streets of Saltillo, Mexico after capturing the town in 1846

Fort Redan James Robertson's picture of this fort at Sebastopol in the Crimea shows no sign of the carnage that took place when it was captured in 1855



James Robertson/Victoria and Albert Museum

going to the people at home.

Even if photographers wanted to take realistic action shots, the market for them was limited. They had little intrinsic news value because newspapers had no means of reproducing them directly. Half-tone blocks were not invented until late in the 19th century, and each photograph had to be laboriously copied by hand onto a wooden block. By the time the wood block was produced, the picture was no longer news.

The earliest 'war' photograph still in existence shows General John Wool of the US Army during the war of 1846—



48. It is a daguerreotype (see page 564) believed to have been taken by a street-corner portrait photographer living in Saltillo, Mexico. Another photograph taken by the same man is credited with being the first photograph of a battlefield—at Buena Vista.

Contemporary with the unknown photographer in Mexico was John MacCosh, an amateur photographer and British Army surgeon serving with the Bengal Light Infantry. During the second Sikh War of 1848–49, MacCosh took calotypes of his brother officers and one of the British commander-in-chief, Sir Charles Napier. By 1852, MacCosh had gained enough expertise to follow events



Crimean scenes
A group of French and British soldiers relaxing together (top). Many women also travelled to the Crimea as cooks, nurses or to accompany their husbands.

Fenton's van
Fenton took this picture of his assistant Marcus Sparling (centre). Balacava
Fenton took this shot just after he arrived in the Crimea. The port is crowded with the steam and sail ships that carried troops, arms and general supplies to the army

in the second Burma War. Though there is no record of the fighting, MacCosh's series of 20.5 × 20 inch paper negatives of British artillery and troops outside the Grand Pagoda are deservedly famous.

A private named Karl Baptist van Szatmari took some widely acclaimed photographs, now lost, of the Russo-Turkish war in 1859, but it was the Crimean War of 1854–56 that stimulated most photographic activity. The British War Office trained and equipped a number of soldiers, first Richard Nicklin and then Brandon and Awson, and sent them to the Crimea to take pictures of military installations and conditions.

Unfortunately, none of these military photographers were successful—Nicklin and all his pictures were lost when his ship sunk in a hurricane; Brandon and Awson's photographs faded rapidly.

Next time the War Office sent a photographer, they decided to send someone of some proven skill. They chose Roger Fenton, a painter, solicitor and amateur photographer. His brief was slightly different from his predecessors'.

When Lord Newcastle, Minister for War, decided to send Fenton to the Crimea to record events, he was not prompted by a desire to show the reality of war. The public outcry that had followed the reporting of the war by the *Times* correspondent William Russell demanded an answer. The government had been heavily criticized for its handling of the Crimean War. What could be better than a series of photographs showing how well equipped, jolly and efficient the British war machine was?

Fenton realized that his task would not be easy. To transport himself, his equipment and darkroom, he bought a wine merchant's carriage and converted it to





Fort Taku, China In Felice Beato's picture, taken during the Second China War, the dead are shown where they fell. Fort Taku, the stronghold guarding Peking, was taken in 1860 by the invading British army

house his darkroom and living quarters.

After several months preparation, Fenton set sail on 20 February 1855 in the *Hecla* along with two assistants, five cameras, 700 glass plates and letters of introduction from Prince Albert to the leading army commanders in the Crimea. After a brief stop at Gibraltar, where Fenton bought four horses to haul his wagon, the ship anchored at Balaklava on 8 March 1855. The problem of landing his equipment was such that he later confessed, 'I don't think, if I had foreseen all the difficulties . . . that I should have had the courage to come . . . If I could get none but official assistance, Sebastopol would probably have been taken by men and arms, but not by photography.'

With him Fenton took the new wet collodion process. This was much better than the daguerreotypes and calotypes

used by earlier war photographers. It needed just a fraction of the exposure time and produced a crisper, sharper, grainless image. Unlike the original daguerreotypes which were limited to one copy, or the calotypes which produced very soft-imaged negatives, the wet collodion process could produce an unlimited number of prints.

It did, however, suffer one major drawback. The glass plate had to be sensitized immediately before and after each exposure. Good results could only be obtained by keeping the plate damp during exposure. If allowed to get dry before development, clarity was lost. To take clear pictures, therefore, the photographer had to take his darkroom with him wherever he went.

The conditions Fenton had to work in were appalling. After the bitter spring of his arrival, the summer heat became unbearable. 'The plagues of flies commenced', Fenton was later to reveal to an audience at the Photographic Society. 'Before preparing a plate, the first thing to be done was to battle with them (the flies) for possession of the plate. The necessary buffeting with handkerchiefs

and towels having taken place, the intruders were expelled. The moment the last one was out, the door had to be rapidly closed for fear of a fresh invasion and then some time allowed to pass for the dust to settle before coating a plate.' Fenton's equipment van, though painted a light colour, would grow too hot to touch in the noonday sun. The heat was such that the collodion dried too quickly. His health broken, Fenton returned to England in June 1855.

Though the quality of his photographs taken in the Crimea is excellent for their time, few convey the full horrors and tragedy of the campaign. Fenton's letters home to his wife and friends did not spare the shocking conditions. On 2 June 1855 he wrote, 'We came upon many skeletons half buried, one was lying as if he had raised himself upon his elbow, his bare skull sticking up with still enough flesh left in the muscles to prevent it from falling from the shoulders.' Yet in his photographs there are no skeletons. Indeed there is no evidence of death at all. His brief—to raise public morale at home and reinforce the attitude that this was a just war fought with little bloodshed—he executed to the letter.

Even so, when Fenton returned home with over 300 plates—mostly landscapes and officers and men hosting their allies in the field—his reception was extraordinary. He was feted, wine and dined. To her diary, Queen Victoria confided, 'We dined alone and looked at some interesting photographs taken by Mr Fenton in the Crimea—portraits and views extremely well done—one most interesting of poor Lord Raglan, General Pelissier and Omar Pascha together on the morning the Quarries [a Russian stronghold] were taken.'

Fenton's photographs are still of interest—not so much for what they show. The camera does not lie, but it can give a distorted picture by omission.



Felice Beato/Victoria and Albert Museum

John Burke/National Army Museum



Death of a Confederate sharpshooter

This poignant picture was staged by Gardner and O'Sullivan after the battle of Gettysburg in July 1863 when over 10,000 men from north and south died

Captured forts are shown but only after the bodies and debris have been cleaned up.

Yet if Fenton failed to show the reality of war, his successors in the Crimea did little better. One of these, Italian Felice Beato, became official War Office photographer on the strength of his pictures in the Crimea. Nevertheless, as his experience of war photography grew, Beato's shots came closer to the grim reality of war.

By the time of the Japanese War of 1864, Beato's style had developed towards the kind of immediate and realistic pictures more recently associated with war photography. But it was

with the American Civil War of 1861-1865 that the art of war photography really developed.

Most of the images associated with that war were the work of one man, Matthew Brady. When the war began, Brady had already amassed a fortune from his daguerreotype portrait studios in New York and Washington. The son of poor Irish immigrants, Brady had begun collecting a comprehensive series of photographic portraits of 'Illustrious Americans' for an illustrated history.

With President Abraham Lincoln's encouragement—Lincoln is reputed to have said that Brady's portrait of him in 1860 had helped to win him the election—Brady set out with General Irving McDowell's army on the morning of 16 July 1861 to the Confederate army's stronghold at Centreville, Virginia. With a photographic wagon similar to Roger Fenton's, Brady witnessed the first battle

of Bull Run and the rout of the northern Unionist army.

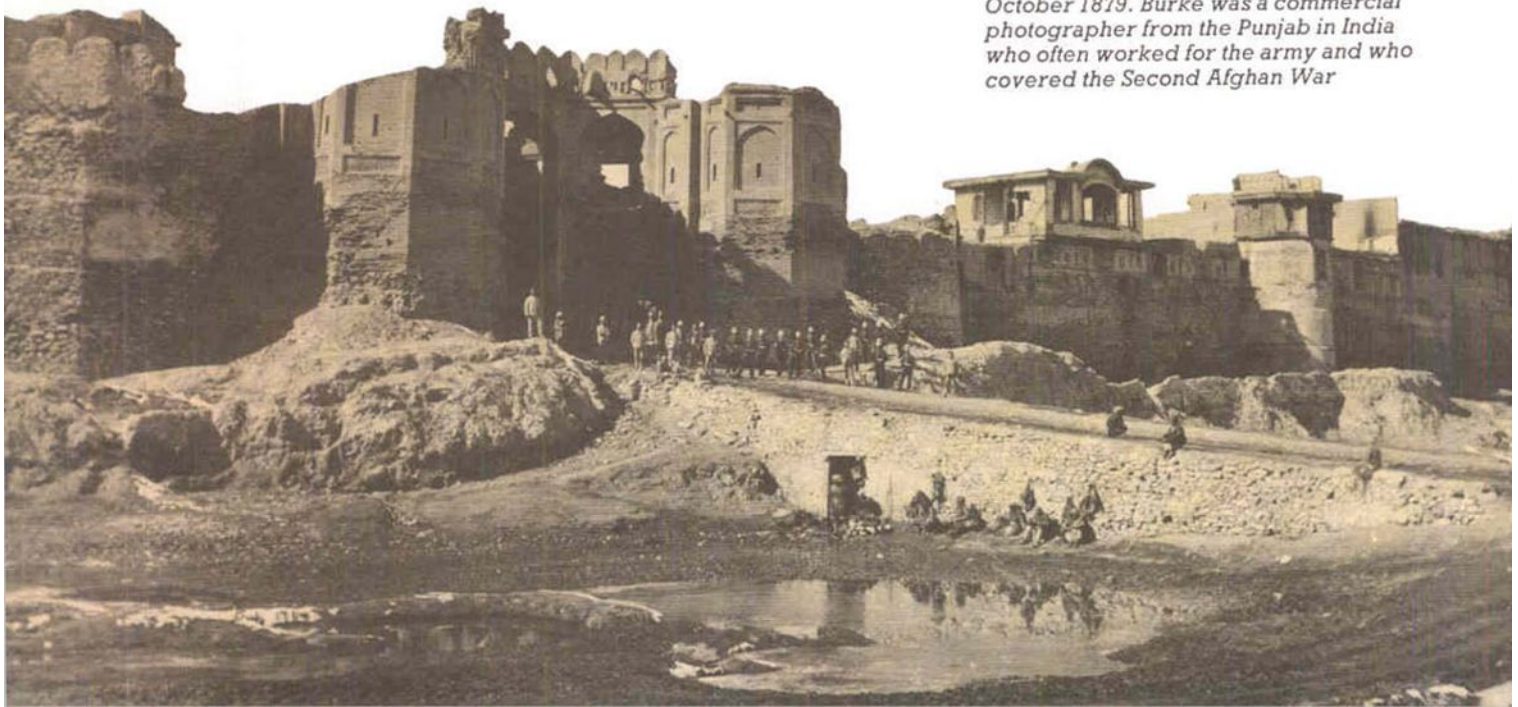
'Brady has shown more pluck', wrote a contemporary after the battle, 'than many of the officers and soldiers who were in the fight. He went . . . with his sleeves tucked up and his big camera directed upon every point of interest on the field. Some pretend, indeed, that it was the mysterious and formidable looking instrument that produced the panic. The runaways, it is said, mistook it for the great steam gun discharging 500 balls a minute, and immediately took to their heels when they got within its focus.'

Brady limped back to Washington three days later to print the plates he had managed to salvage when his wagon overturned. They were an instant success and he received high praise in the press for the way they showed the truth. They also sold well, and Brady saw that there might be a popular market for war photographs after all. The war was showing no signs of ending quickly, so Brady recruited a team of photographers. They included Alexander Gardner, the gifted manager of his Washington studio, and Timothy H. O'Sullivan, later to distinguish himself with his pictures of the Wild West. Together, Brady and his team were to produce some of the finest photographs of the Civil War. They aimed to produce stereoscopic views of battle scenes which they could sell to the public.

By the end of the war Brady and his ever-growing team of photographers had produced a huge stock of photographs at a cost to Brady of some 100,000 dollars. Although his reputation as a photographer remained high, Brady found that the public showed little interest in these prints, despite his hopes. Worn out by the war, the public wanted to forget.

Even the government, on whose behalf Brady had started the venture, refused to buy his negatives for posterity.

Bala Hissar Fortress John Burke took this magnificent panorama at Kabul in October 1879. Burke was a commercial photographer from the Punjab in India who often worked for the army and who covered the Second Afghan War





Matthew Brady/The Library of Congress

Tent life Matthew Brady's picture of camp life in the 31st Pennsylvania Infantry at the beginning of the 1861 American Civil War

Virtually bankrupt, Brady was forced to sell his studio and his life's work was sold to the War Department at the knock down price of 2,840 dollars in 1873. A virtual pauper, forgotten and half blind, Brady died a broken man in 1896.

In the years following the American Civil War, public interest in war photography, at least as far as newspaper editors were concerned, remained low. War artists were usually employed to reconstruct battle scenes. A wet-plate photographer took shots of the scene after the event. It was not until the second Anglo-Boer War of 1899 that advances in printing and photographic techniques encouraged photographers to take more news-orientated photographs.

Wars were covered by photographers during the years between the end of the American Civil War and the commencement of the second Anglo-Boer War of 1899, but few of the photographers were professionals. They were, for the most part, serving soldiers with an interest in photography. The Anglo-Abyssinian War of 68, for example, only produced some well composed, but heavily posed photo-



After Cold Harbor This macabre picture was taken by James Reekie in April 1865. Soldiers collect up the remains of the dead after this fierce battle which proved to be a turning point in the defeat of the Confederate army

graphs taken by Sergeant Harrold and six sappers of the Royal Engineers, though the war itself was not without interest. Under the command of General Sir Robert Napier, 60,000 men, 8,000 camels and 44 elephants set out on 2 January 1868 to free the British Consul and 60 Europeans held hostage by the Abyssinian King, Theodore. Yet no photographs of this extraordinary army or its capture of Magdaler on 13 April were taken. Even the bloody events of the Paris Commune of 1871 failed to produce many moving images.

Perhaps the finest photographs of war taken during these years are of the second Afghan War in 1879 taken by a professional photographer, John Burke. They were reproduced as engravings in the London Graphic after he was commissioned by the British army to accom-

pany British troops on their advance through the North-West Frontier to Kabul. While his pictures of the troops are posed, his landscapes are magnificent, even by today's standards.

At the end of the century it was still the printed word that was relied upon to convey the full horror of war and it is misleading to blame the early war photographers for failing to capture this. It took the two world wars and the explosion of the news media in the twentieth century to make war a subject of universal terror and pity. Early war photographers were not only hampered by the extreme technical limitations of their bulky equipment, but also by the lack of sustained public interest in their work. Despite these limitations it is their photographs that today convey the fullest picture of nineteenth century warfare.



Creative approach

From cottage to castle

Photographing architectural subjects can be very rewarding. Once you have mastered the basic problems of perspective, composition and lighting, every building offers creative potential for the photographer

Even in the smallest town there is usually an immense variety of buildings, each with its own individual character, charm and style. And as most buildings are designed to look good, many hold great potential as particularly attractive subjects.

Unfortunately, as all too many photographs show, whatever the theme, simply having an attractive subject does not automatically guarantee an attractive appealing picture. For a start, buildings are meant to be seen in three dimensions, not two, so to convey photographically something more of a building than a flat unimpressive image, a careful, thoughtful approach is needed. Given this, even the humblest crofter's cottage can make as interesting and attractive a picture as the most splendid medieval castle.

One of the most important considerations in architectural photography is that of light. Good light can literally make or break a picture. The right weather

conditions and the right time of day can reveal the best in any building. The colours of brick and stone acquire their full value in sunlight, and textures and details are thrown into relief, allowing you to concentrate on those aspects of the structure which interest you most.

Different types of daylight suit different buildings and, if you have time, it is a good idea to observe buildings under various weather conditions, and at various times of the day. A few minutes either way can see one wall plunged into the deepest shadow or dramatically lit by diagonal light as the sun moves steadily around. Always be ready to take advantage of rapid changes in light. A break in the clouds can send a shaft of light across an otherwise dull cityscape, picking out buildings and giving them extra solidity. Always look for the special 'something' which conveys the atmosphere of each particular building.

Strong clear light is particularly good for bringing life to dull grey stone work.

Even the most uninteresting stone buildings can be made attractive by the warm light just before the sun goes down. Strong directional light is also good for abstract photographs of buildings and architectural details; shapes and shadows are more pronounced and can be isolated to form very attractive compositions.

Other buildings may look better in the diffused light of a slightly overcast day. A white building, or a wall that is always in shade, for instance, is better illuminated by soft light reflected from the clouds. On the other hand, a bank of heavy clouds on a wet day or the menacing appearance of a stormy sky may provide an atmospheric backdrop for Gothic buildings or castles. Wet weather is also appropriate when you want a

Silver roof *It is always worth waiting for the moment in a storm when a shaft of light suddenly illuminates a feature of a building against a dark sky*



grim shot of desolate buildings such as a large factory or rundown slums.

Under certain lighting conditions, filters can also be valuable. 81 series filters are useful for warming up the colours of stonework on an overcast day and by using a 5R filter you can add an attractive pinkish hue to an otherwise dull stone building.

A polarizing filter may help to visually separate a building from its surroundings, particularly on a sunny day, because it dramatically darkens blue skies and increases contrast. Use a polarizing filter for eliminating unpleasant reflections from modern glass buildings as well. Reflections are not the only problem when shooting in strong sunlight; extremes of contrast may also

be difficult to cope with; areas of deep black shadow may fall right next to intense highlights where the sunlight catches a white wall.

But you can use these extremes of contrast creatively. With a small building in the centre of the frame, for example, heavily shadowed by the tower blocks around it, you have to decide whether to expose for the highlights or shadows. If you want the small building to appear as a dark, barely visible shape set dramatically amongst the full brightly-lit blocks, you can expose for the highlights. Remember that most TTL meters are centre-weighted, however, and if your camera has automatic exposure it may expose for the shadow in the centre. So, with an automatic camera, you must

be prepared to use the manual override if possible.

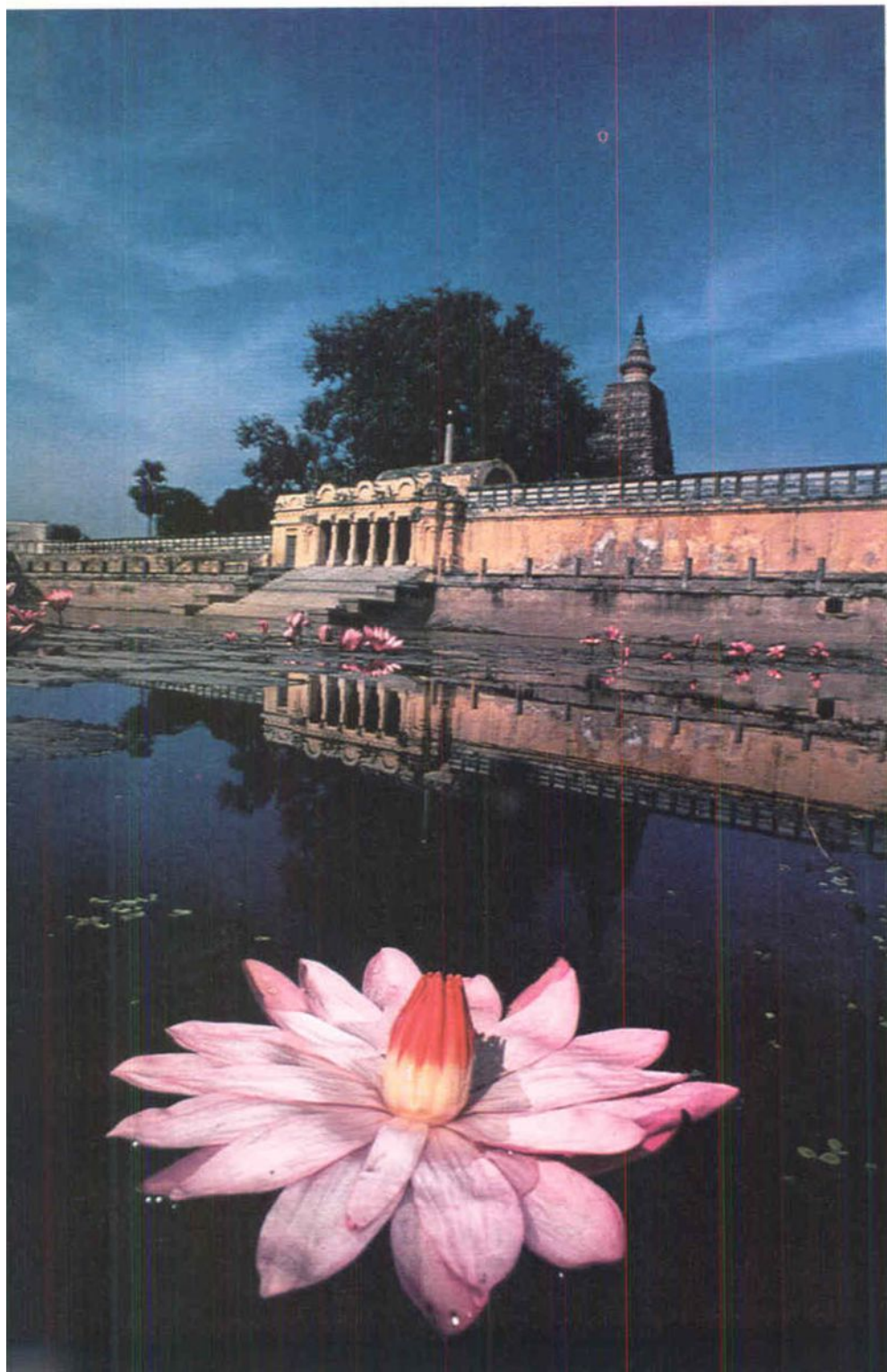
Another problem associated with photographing buildings which can also be used creatively is the problem of converging verticals. This occurs when you point a camera upwards to include the whole of a building in the frame. The building appears to lean away from the camera: the effect becomes even more dramatic with wide angle lenses. This is because by tilting the camera you have placed the film at a different angle from that of the subject. Although the effect can be exploited creatively to produce some striking images, particularly of modern high-rise buildings, it usually spoils photographs and is best avoided.

You can avoid converging verticals by keeping the camera exactly parallel with the face of the building but you may cut off the top of the building in your photograph instead.

With a 35 mm camera, one solution is to turn the camera around to use the vertical format. However, although this may admit the top of the building into the frame, it may also include a large and perhaps uninteresting foreground, especially if you are using a wide angle lens. Frame your shot to include a tree, flowers, a group of passers-by or some other interest in the space in front of the building. The creative use of the foreground can make the final image much more arresting. But watch out for unwanted distractions in the foreground—

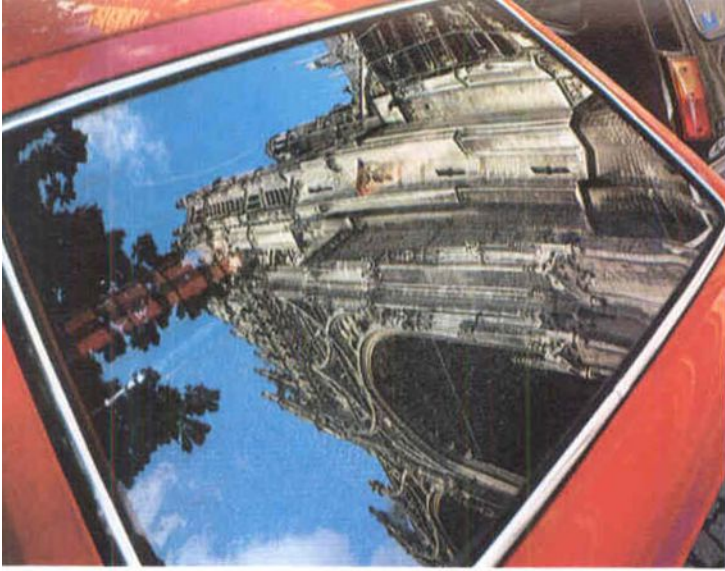
Temple and lotus A wide angle lens has a great depth of field and enables you to relate foreground and background elements in a pronounced way

Barn Even the most mundane building can make a good picture. Try using a long focal length lens to concentrate on pattern, colour or texture



Robin Bath





John de Visser

lamp posts, parked cars, unsightly pavements or gutters.

Another way of avoiding converging verticals is to find a higher view point—perhaps another building across the road. If your new viewpoint is sufficiently far away, you may be able to use a medium telephoto to isolate the building from its surroundings or to select individual details.

Other more elaborate techniques and special equipment designed to cope with converging verticals, are outlined in a subsequent article.

If you are planning to photograph buildings, aim to take as many lenses as you can carry easily so that you can shoot the same subject from a wide range of viewpoints. It is also worth taking a tripod because it is that much easier to compose your picture carefully with the camera in a fixed position. You will find, too, that a mounted camera decreases the temptation to 'shoot from the hip' and that you give each exposure more attention and thought.

When you are composing your shots,

Reflection Give a new slant to photographs of buildings by looking for an unusual approach. This reflection works well

Bow fronts Dull skies create ideal conditions for enhancing subtle colouring. Using a telephoto lens from an angle brings out the form of these houses



George Wright



Steve Herr/Vision International

Claude Genet/Sepia



Balcony The photographer has picked out one balcony from many similar ones on a block of flats with a telephoto lens, and made maximum use of the lines of shadow in the bright sunshine to emphasize the abstract composition



Suburbia *A carefully chosen high viewpoint reveals the pattern made by this housing development, while the flatness of the lighting gives a quiet mood*

bear in mind that buildings are made by people and for people. Often you can create more interest and atmosphere in your photographs by including people in the frame. You may have to wait a little before the cleaner moves to exactly the right place or the people emerge after work, but it is often worth the effort.

Sometimes, however, a building can look better when people are deliberately excluded—in a shot of a grand old building, for instance, passers-by may be unpleasantly distracting. In a busy city scene, though, you may find it virtually impossible to shoot before somebody wanders into the frame. One solution is to get up very early in the morning and take your picture before anyone else is around—early morning light can also be very attractive. If you want to shoot at a busier time of day, you can use a neutral density filter that allows a long exposure, so that anyone moving does not register on the film (see page 344).

An area worth exploring is the relationships between buildings of different sizes and styles. Contrasts in style or size can often be emphasized by using a long focus lens because the apparent flattening of perspective brings buildings close together.

When relating a building to its surroundings, scale is important, and this can frequently be conveyed by including figures so that relative size is understood immediately by the viewer. The sheer enormity of many formal gardens, like Blenheim Palace or Versailles, can be conveyed by including a tiny human figure. Abstract geometrical patterns, like a paved courtyard can also convey a sense of space.

When you are photographing buildings in rural settings, the wide open spaces can be used to advantage but try to relate the building to its surroundings. Many thatched cottages, for example, have lovely gardens which have almost become part of the house; it would be absurd not to include at least some of the garden when photographing the house. By photographing a castle from a vantage point that includes its setting, you may be able to convey some of the impact it had in times of old. Remember too that many castles used water as a defence, and reflections from the moat can add greatly to the composition. Given a still day, and good weather conditions, you can take a photograph in which it is hard to tell the real bricks and mortar from their watery double. However, it is as well to have a polarizing filter at hand to reduce unwanted reflections if, for example, the water surface is disturbed by wind.

Try to find a good viewpoint for your subject. Sometimes the right viewpoint is immediately obvious—some

buildings positively demand to be seen from certain angles. At other times you may have to walk around for hours before you find the right approach.

On trips to little known country areas, or when travelling abroad, it is worth having a detailed road map to help to find the best vantage point. It may also help you discover remote buildings—abandoned houses, tumble-down cottages, empty farms, and crumbling castles are all excellent subjects. The sad atmosphere and the picturesque nature of decay can provide an evo-

cative and wistful photograph, particularly if you shoot early in the morning or late in the afternoon when long shadows throw fascinating patterns across the richly coloured brickwork or the weathered stone pile ruins.

If you develop an interest in architectural photography, the vast number of buildings found in any town or city means that you will never be short of subject matter. Once you have mastered problems of perspective, composition and lighting you will be rewarded with many attractive photographs.

Fog Shooting from a taller building nearby, the photographer used the swirling fog of San Francisco to make the most of the space age nature of the tower



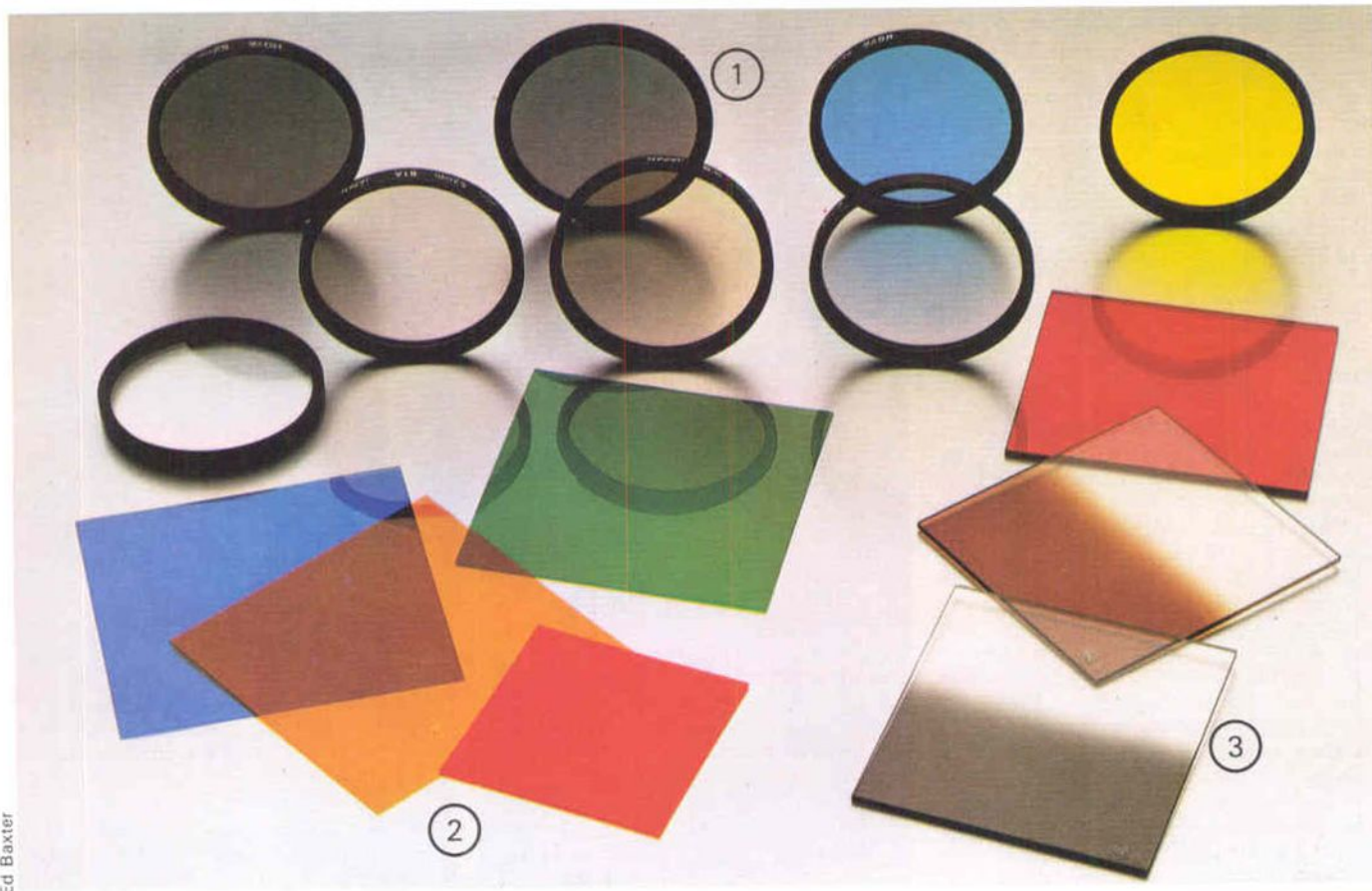
J. Dejour/Explorer



Equipment file

Lens hoods and filters

Lens hoods and filters are inexpensive but very worthwhile additions to your camera outfit. And as well as making picture taking in difficult lighting conditions easier they also protect your valuable lenses



Ed Baxter

Even the simplest of cameras have lenses with threads or a bayonet fitting at the front to take a variety of accessories. Some of these accessories have very specialized functions and are of only limited use in day-to-day photography, but by far the most common and practical are filters and lens hoods.

Lens hoods

When you look through a camera's viewfinder, you may only see light that is reflected directly from the subject—but light from sources outside the picture area also reaches the lens and, consequently, reaches the film on exposure. This extraneous light may adversely affect the picture, veiling it with a light fog and reducing contrast. In extreme cases, a bright highlight, such as the sun just outside the picture area, can create flare on the film and spoil your pictures.

Filter types Screw-on filters 1 are best for colour correction, but gelatin squares 2 are available in a greater range of colours. Plastic filters 3 are best for special effects

Most lenses have elaborate baffle systems that cut down unwanted light but these are not completely effective. By fitting a good lens hood, however, you should be able to overcome the effects of stray light in all but the most extreme conditions.

Ideally, a lens would cut off all light coming from outside the picture area but leave the picture unaffected. Unfortunately, this ideal is almost impossible to achieve. The hood would have to be precision made to suit not only the camera format, but also the angle of view of each individual lens. Even if this could be done, it would have to be



Ed Baxter

Lens flare Without a hood, stray light from outside the frame can enter the lens and cause flare

perfectly aligned on the lens for every shot and move in and out with every change in focus.

Understandably, lens hoods must compromise. By far the majority are round and made of metal, plastic or flexible rubber. While they do not cut out all unwanted light, round hoods cut out the worst of it, and are light and easy to use. Manufacturers usually supply round hoods for all their own lenses but you can buy independently made hoods in either wide angle, standard or telephoto fittings with thread sizes to suit your own lens.

In fact, the difference between a round hood for one lens and that for another is often not that crucial. Many telephoto hoods can be used on a standard lens without cutting off any of the frame, but since a telephoto hood can be longer than a standard lens itself, it may look rather odd. Round hoods for wide angle lenses are rarely of much optical value although they do help protect the lens—and sometimes a standard rubber hood for a standard lens will shade the lens just as effectively.

In some circumstances, particularly for shots where you want absolutely precise shading, you can use rectangular hoods which are often designed for specific lenses. A good rectangular hood cuts off nearly all light from outside the picture area while still allowing some margin for small changes or errors.

Rectangular hoods are of three basic types: metal hoods to fit particular lenses; bellows type universal hoods for all sizes and types of lens; and small plastic hoods which attach to universal filter holders such as the Cokin series.

Metal hoods are lens-specific and if one is not supplied with the lens it usually has to be ordered. Each of these metal hoods can only be used on one lens and indeed some lenses, particularly extremely wide angle lenses, need a hood so perfectly aligned that it must be permanently fixed to the lens.

Bellows hoods, however, are much more versatile and can provide accurate shading for a wide range of lenses.



Hooded lens With a lens hood fitted you can reduce flare, and pictures will show a much sharper image



Differences in camera format are accommodated by placing a mask of the appropriate shape over the front of the bellows. Differences in lens size are accommodated by moving the bellows in and out along a base rail—each camera format mask is marked with the focal lengths of lenses and corresponding settings on the rail. Makes such as the Ambico Shade plus, Ewa and B & W Compendium have an interchangeable mounting thread, a slot for filters, a base rail and a bellows hood that extends to 15 cm and collapses to 2 or 3 cm.

A bellows hood fitted with a mask cuts out unwanted light better than any other arrangement but can often be larger than the camera itself. Neither are such hoods robust, and for close-up work in particular they are too fragile and cumbersome. But for a zoom lens, they may provide the answer.

Hoods for zooms

Zoom lenses are, for a number of reasons, notoriously difficult to shade properly, yet with so many lens elements they need protection from stray light more than any other lens.

First, a normal hood could not give good shading for every focal length. If it were sufficiently deep for the longest focal length it would cut off the picture at shorter focal lengths. Secondly, the optical design of most zoom lenses means that anything close to the rim of the front element tends to appear in the final picture.

Unlike many fixed lenses, zoom lenses are often supplied without a hood attached and the hoods you can buy separately tend to be very much a compromise. Any lens hood, however, is

Lens hoods Telephoto lenses often have a slide-out hood 1 permanently fixed. Bellows hoods 2 provide the most protection and can be used with any focal length lens. Slide-on metal hoods 3 and 4 are for use with specific lenses, and a collapsible rubber hood 5 will fit most standard lenses

better than none at all, and even an inadequate one should be used if nothing better is available.

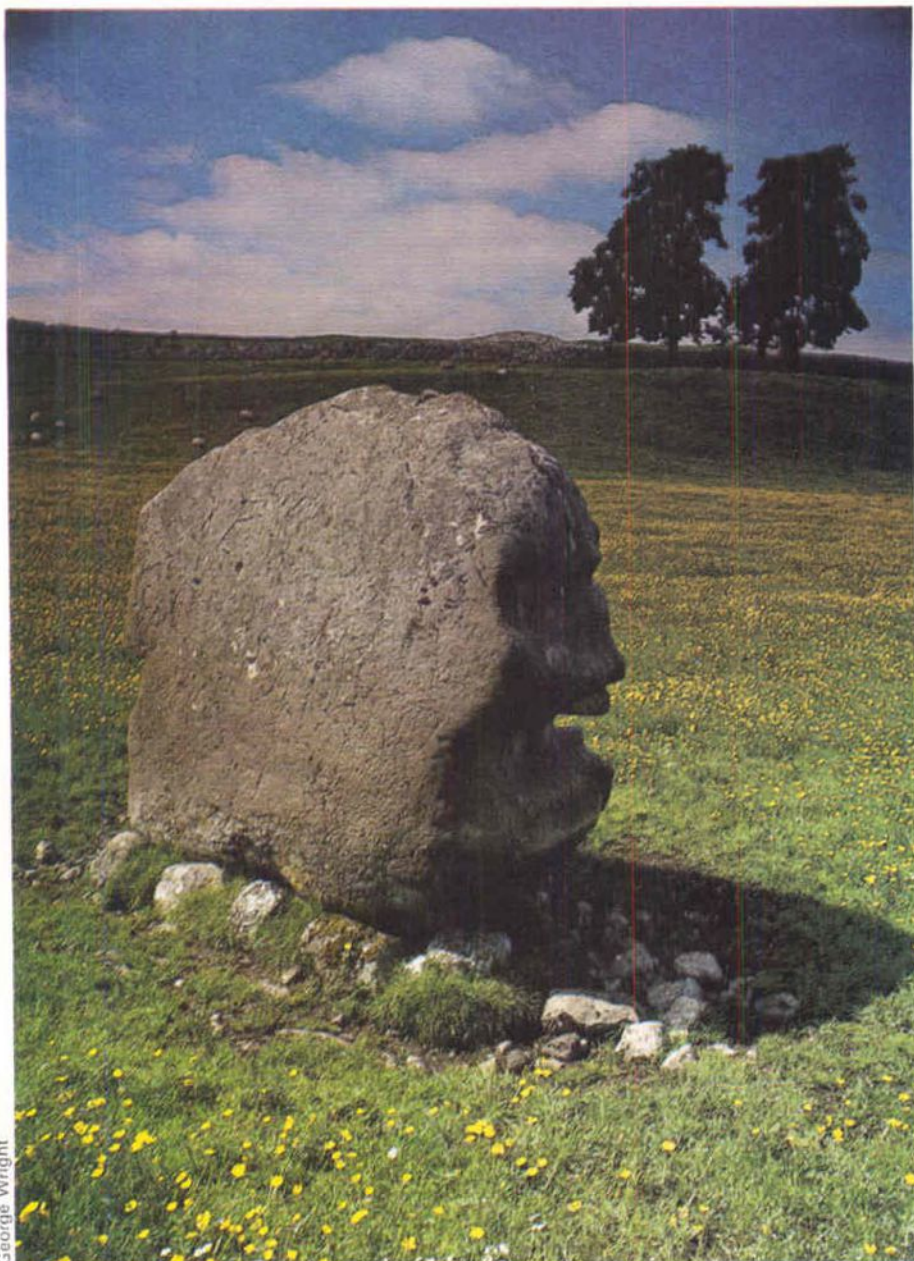
However, you can buy cutaway or scalloped lens hoods for some zooms. These have sections cut into the rim to allow for the picture corners, and are as good as rectangular hoods. They are also available for wide angle lens of less than 24 mm. But they must be perfectly aligned to avoid cut-off corners or unwanted intrusions into the picture.

Choosing a hood

Whichever lens you intend to use the hood with, it is worth making a number of tests before buying. Of these, perhaps the most important is to try the hood on the lens and check that it does not cut off or vignette the picture.

You can check for vignetting in two ways. If you have a manual exposure SLR or an automatic SLR with a depth of field preview, you can check through the viewfinder. With the lens focused on infinity, point the camera at a large, distant, plain area such as the sky and stop the lens down to its smallest aperture. If there is any sign of darkening in the corners of the frame when you press the preview button, the hood is cutting off the light from the picture.

Even if there is no trace of vignetting, a second check is necessary because



few SLR screens show more than 95 per cent of the total picture area. For the second test, once you have found a hood which seems roughly correct, take the camera into a darkened corner of the room and open the camera back. Set the shutter to 'B', and press the release. With your eye roughly where the film should be, look through the back of the camera through the lens at a small light source such as a single unshaded bulb. You should be able to see the light from any part of the film plane, even at the very corners of the frame. If the light source disappears as you move your eye from behind the centre of the lens, the hood is cutting off the corners of the picture.

If your camera is an automatic, you may not be able to hold the shutter open like this. Instead, take a photograph of a flat tone, and examine the negative or slide for darkening at the corners.

Once you are sure the hood does not produce vignetting, examine the inside

Standing stones Using a graduated filter darkens one part of a scene, here the sky, to bring out detail interest elsewhere

Windmill With an orange filter fitted, you can increase the contrasts in a scene and create dramatic black and white pictures

for any shiny surfaces that might reflect light. A good hood should have effective blackening with matt paint, ribbing to cut reflections, and absence of any chrome or bright areas inside the hood itself. Flock or velvet lining works very well, but if you ever clean the lens with a silicon cloth and have a flocked hood fitted, it can easily pick up bright yellow or blue fibres from the cloth. These are virtually impossible to remove and render the hood useless.

Because it can be difficult to use filters with a hood that screws into the filter threads, some hoods have small press-

button catches. They are pushed into the filter thread and tightened a quarter turn. This makes it much easier to fit and remove them, and prevents the hood from becoming tightly locked to the lens.

You can also buy slip-on hoods. These can often slip off just as easily as they slip on, although a few slip hoods have a locking screw.

Filters

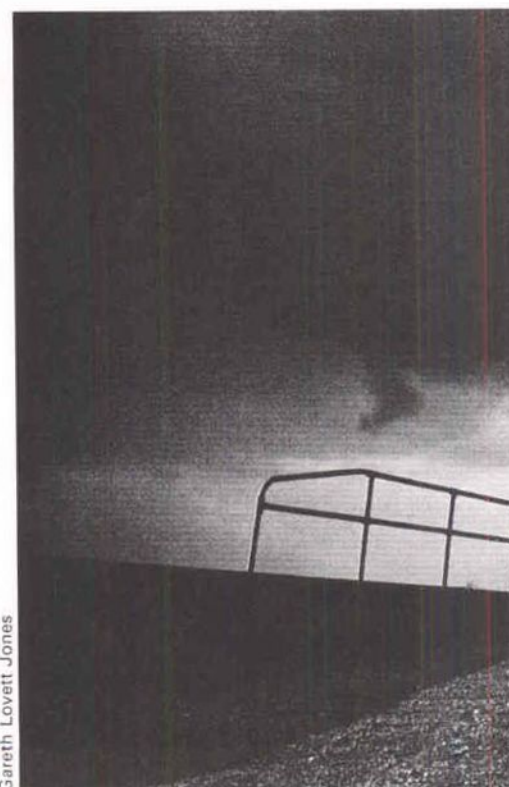
It is often said that a filter can add colour to a picture, or 'put the skin in'. In fact a filter cannot add anything; it can only take away. The purpose of a filter is to remove unwanted wavelengths of light. Other 'filters' may give soft focus or perhaps act as a close-up lens, but these are really special accessories, not filters.

A good filter should have no effect on the incoming light other than to remove the unwanted portion, so it must be thin, clear and totally distortion-free.

The best filters are sheets of coloured gelatin and you can obtain almost any colour density filter you are ever likely to need in gelatin. Kodak's Wratten range and the Hellma range of gelatin filters are both extensive.

Unfortunately, gelatin filters are not only expensive but fade quickly and are very susceptible to damage. They can be scratched easily and distort when touched. They also dissolve in water and cannot be used in the rain.

Understandably, most photographers prefer dyed filters of flat optical glass for everyday use. A single sheet of high-quality thin glass is made to the same standard as lens elements. Colouring is not achieved with an organic dye as used in gelatin, instead, chemicals are used. Such filters fade very slowly and





Filter holders The technical filter holder (left) can hold several gelatin filters. The system holder (right) is for plastic filters

have good resistance to wear. A few glass filters are not dyed, but sprayed with a lacquer (graduated sky or 'chromo' filters, for example) and need treating with care.

Glass filters are usually, like many lenses, coated to reduce reflections. Most types are single-layer coated, which reduces flare a little. Some are multi-coated to cut down the risk of ghost images or flare marks further.

A recent development, *organic glass*, is a plastic material of good optical quality which is fairly scratch-resistant. BDB Filtran, Cokin and Filteck filters are of this type. Plastic filters are easy to engrave, emboss, spray colour, dye colour, and are very simple to make.

As a result there is a wide range of different plastic filters including most of the colour correction values which are available in gelatin and optical glass. However, plastic filters are not as accurate in colour values and are intended only for everyday use. For more precise filtering, you need either gelatin or dyed glass filters.

There are also cheap flexible acrylic and thick gelatin filters, made for the theatre and film industry, which fit on lights or windows. They may look perfectly flat and clear visually, but they blur the fine detail sharpness of pictures if you shoot through them. Only use them over lights or flashguns, or for special effects—not over lenses.

Filter holders

Glass filters are normally held in brass rings that screw directly on to the front of the lens. Plastic filters, however, are held in *system holders*. System holders use a ring that is permanently attached to the lens. On to this ring clips a square holder. A lens hood, should you want to fit one, can be attached in front of the filter mount.

If you need to use gelatin filters frequently or you want to change plastic filters without disturbing the camera, a *technical filter holder* is a better choice. You can put several gelatin filters in this, though only one plastic filter can be inserted. The technical holder opens like a book, with a soft lining to avoid scratching the filters, and a central hole.

Thread sizes

A feature that often proves confusing when buying filters is the wide range of filter thread sizes available. Obviously the filter must be wide enough to cover the front of the lens without any vignetting—and what suits one size lens may not suit another. Neither will a filter that fits one standard lens necessarily fit another. While some manufacturers make all their own lenses to take the same filter size, many do not, and if you use lenses made by various manufacturers it is unlikely that one set of filters will fit them all. Unfortunately, there is no easy solution to this problem.

However, you can buy step-up and step-down rings that allow you to use a filter on a lens with a different thread size. This means that even if you do have lenses with several different thread sizes, you may only have to buy one set of filters. But you must be careful not to introduce vignetting. Using conversion rings may also call for a new lens hood.

Special filters

Certain lenses require special filter systems, usually for optical reasons. Fish eye and ultrawide angle lenses sometimes have a large convex front element, and it is impossible to fit filters to them. These lenses have built-in filters which can be brought into place by turning a dial on the rim of the lens.

Lenses that have a very large front element—notably super telephotos—frequently have a filter drawer close to the camera body. Small filters can be fitted to this compartment, and the lens is sometimes sold with a set of the more commonly used filters. A disadvantage of this system is that the lens often has to be removed from the camera to fit the filter. Some modern lenses, though, have a front filter drawer.

Most lens hoods are simple and valuable additions to any camera outfit. They are relatively inexpensive compared with other photographic equipment. Most filters, and the cheaper hoods, cost about the same as one roll of film and a filter holder costs very little more. These simple devices are easy to use and can clearly improve the quality of many of your pictures.



Colour slide film

Colour slide film records the image in much the same way as colour negative film, but on a slide you see the colours of the original scene. So how is this achieved?

Although neglected for black and white work, slide or reversal film is now immensely popular for colour. Indeed, many professionals use slide film almost exclusively. Like colour negative film, slide film is based on the principle of subtractive synthesis of colour (see page 550), but it differs in a number of significant ways.

The emulsion for colour slide film is basically similar to that of colour negative film—it is an integral tri-pack, as described on page 551. It consists of three layers, sensitive to blue, green and red light, with a yellow filter 'layer' beneath the blue sensitive layer that prevents blue light from reaching the other

two layers. Slide film also resembles colour negative film in that the three layers each contain colour couplers which produce yellow, magenta and cyan dyes.

Exposure of colour slide film is also the same as exposure of colour negatives, and different colours of light form an image in different parts of the emulsion. Blue light forms a latent image in the top, blue sensitive layer. The next layer, which is green sensitive, records a latent image of the green in the subject, and the bottom layer of the film records red light.

The real difference between transparencies and negatives lies in the process-

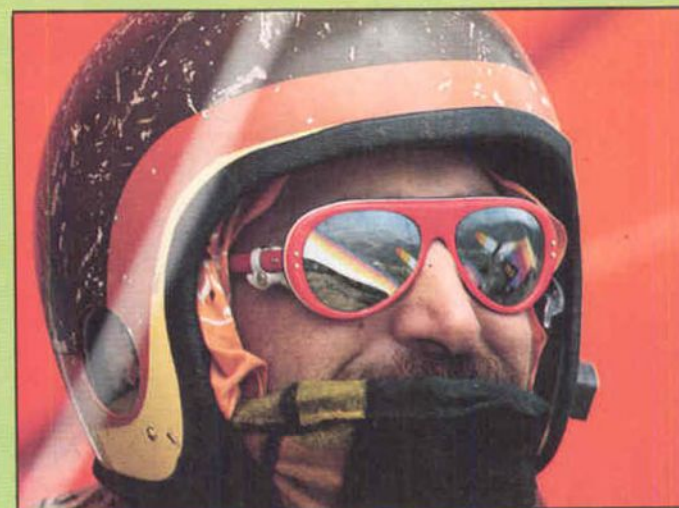
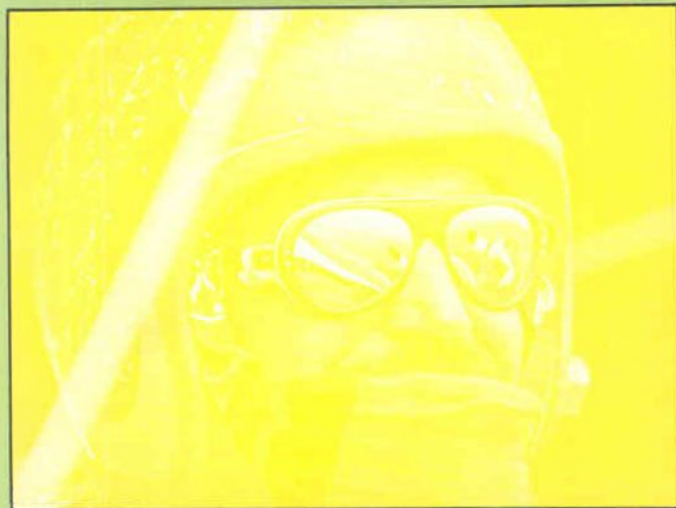
ing. Since slide and negative emulsions are similar, and the latent image is recorded on the film in a similar manner, processing slide film in the same way as negative film would result in a negative image. So, to give its positive image, slide film must be processed by a particular method, known as *reversal processing*. This is why slide film is also referred to as 'reversal' film. Essentially, reversal processing involves developing the latent negative image on the film and then chemically reversing it to give the final positive.

The first stage in processing is to develop the film in a solution which is very similar

to black and white developer. This simply produces a silver image in those parts of the film that have been exposed to light. In the blue sensitive layer, for example, a negative silver image of the blue parts of the subject will appear. The process of development has to be very accurately controlled—the temperature must be accurate to within 0.33°C. This precision is necessary to ensure equal density and contrast in all three emulsion layers.

The second processing step is to 'fog' the film

Three layers The image on a slide is made up from three separate dye images in yellow, magenta and cyan



deliberately—either by exposing it to bright white light, or, more commonly, by a chemical fogging agent. The effect of fogging is to make it possible to develop all the silver grains which were not exposed when the picture was taken. The fogging has no effect on the grains that were exposed in the camera, because these were already developed to metallic silver in the first of the processing solutions.

The next stage is to immerse the film in colour developer. This acts in the same way as the developer for colour negative film—it develops the fogged grains of silver, and simultaneously produces development by-products. These combine with the colour couplers in the three emulsion layers, producing coloured images in each layer where the fogged silver is being developed.

At this point in processing, the film is opaque because there is developed silver over the entire frame in addition to the coloured dye images. With the image already recorded in colour, the silver is no longer required and must be removed so that the colour can be seen. To remove it, the film is dipped into a silver bleach bath, which converts the metallic silver back into silver halide. The silver halide is in turn removed by immersing the film in fixing solution, which converts it to soluble compounds. These can then be washed off, to reveal the final positive colour image.

The process works because the coloured dyes form only in the fogged silver areas, not those areas that were exposed in the camera. The colour of the dye in each layer is complementary to the original sensitivity of the layer: the dye is yellow in the blue layer, magenta in the green layer and cyan in the red layer. In the blue sensitive layer, for example, a yellow dye is formed in the fogged silver areas during processing. Since the fogged silver areas in the blue sensitive layer are all the areas that did not react during the original exposure—that is, they are the areas with no blue in the original scene—the yellow dye corresponds to 'no blue' areas.

Because yellow is comple-

mentary to blue, a yellow filter transmits red and green but absorbs blue. When you look at the final slide against normal white light, the yellow dye formed in the 'no blue' areas acts as a filter, allowing green and red light to pass but blocking blue. Blue is therefore seen only in the areas where there is no yellow dye—the areas that were blue in the original scene. The magenta dye similarly reveals the green areas and the cyan dye shows up the red to give a complete positive image.

Kodachrome film

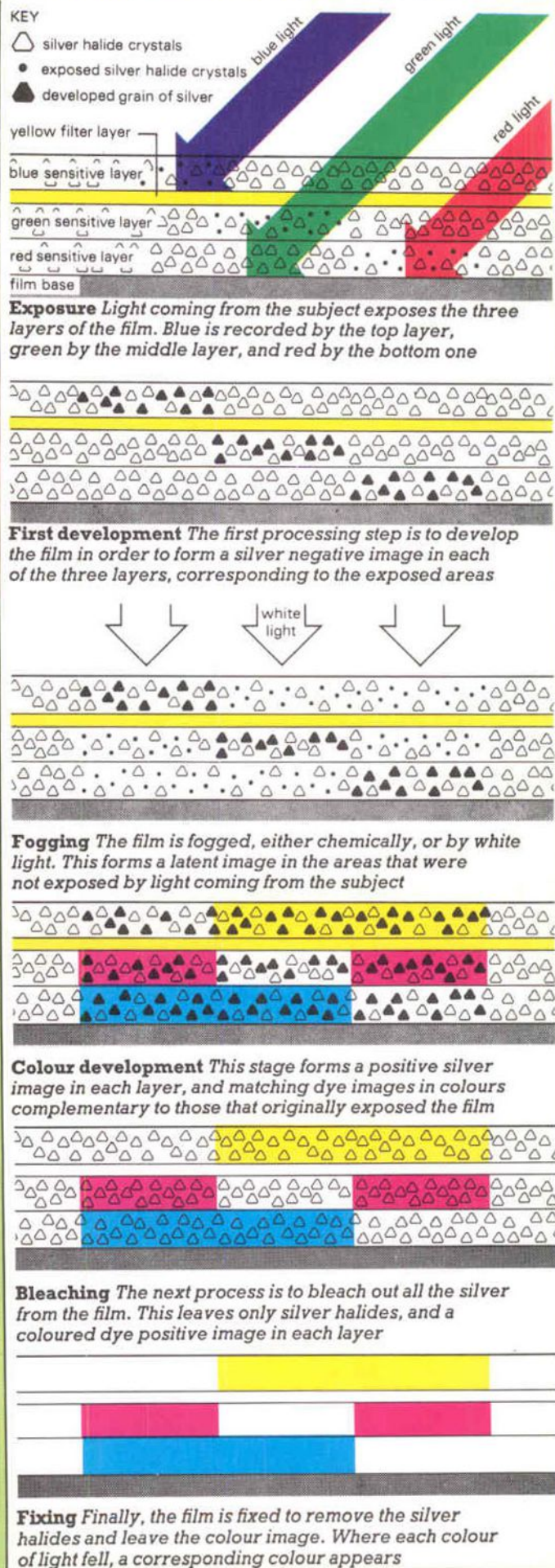
Not all colour slide films have the colour couplers incorporated into the emulsion. One film, Kodachrome, uses colour couplers in the processing solutions instead. These diffuse into the emulsion of the film at a controlled rate during processing. The fogging stage takes place layer by layer, instead of all at once.

Processing Kodachrome is a very complicated procedure and involves up to 24 separate steps. Because of the complexity, home processing the film is impractical and only a few laboratories can handle it. In most countries, the film must be returned to Kodak for processing. Although the Kodachrome process may seem unnecessarily elaborate, it has two important advantages. One is that the permanence of Kodachrome slides is unrivalled—some of the earliest pictures taken on the film show no signs of fading, despite the fact that they were taken in 1935. The second advantage is that the emulsion layers of the film can be made very thin because they do not need to contain bulky colour couplers. This results in a film which gives remarkably sharp results, and an almost grain free image.

Fast colour slides

The emulsion structure of colour slides is not always as simple as the one described here. In fact, many films, particularly fast ones, use several layers, fast medium and slow, for each colour sensitive section of the emulsion. There are also inert gelatin layers between the light sensitive sections, and a protective topcoat.

How slide film works





World of photography

Bob Carlos Clarke

By combining artistic flair with technical skill, this innovative British photographer has created a unique style. His photographs are now very much in demand for their surreal, dreamlike qualities



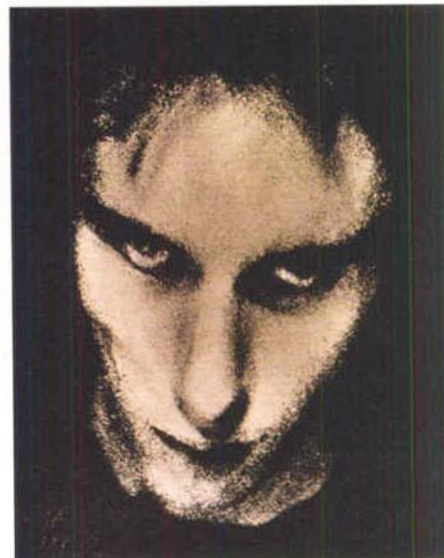
Bob Carlos Clarke's most well known pictures are montages, pictures created by combining parts of various photographs carefully in order to achieve a particular effect.

With his skill in montage, Bob can create dreamlike, surrealistic images by taking elements from his pictures of everyday locations, without ever moving from the bedroom he uses as a workroom. 'The reason I've got more work now than I've ever had is because my work is fairly unique, and also because I'm a unit, I can do the whole thing on a sixpenny bit.' He recently returned from a week in Scotland on a Kawasaki campaign which would have sent other photographers to Bali and Death Valley, 'But we were able to do earthquake scenes, *Apocalypse Now* images and exploding volcanoes in the darkroom upstairs. For Singapore Airlines I did a startling shot of Concorde flying through clouds at night with a six inch model. I simply don't think you could have done it for real.'

Although he enjoys daylight and location work, Bob has a spacious and well equipped studio with Balcar flash units. His original negatives are shot on a Mamiya 6 x 7. This medium format camera enables him to achieve the fine detail he needs for his work. It also has a rotating back so he can take vertical

Hotel Splendid An unusual portrait of Lindsey Rudland made by combining two negatives on Kodalith paper

Self portrait A slow shutter speed turned the movements of Carlos Clarke's head into an eerie picture



Bob Carlos Clarke

Of all the photographers working in Britain today, few have quite such a distinctive style as Bob Carlos Clarke. While it is his carefully crafted fine art studies that are the strongest expressions of his unusual talent, even his commercial work bears his own very individual stamp. Inspired by the works of photographers such as Brassai and artists such as Alan Jones, Bob Carlos Clarke's pictures are arresting and often bizarre, sometimes difficult to come to

terms with, but always unforgettable.

In many ways, Bob's work lies between graphic illustration and photography, since many of his final images are created not in the camera but back at home in the darkroom. He often uses a camera simply to provide the raw material for his pictures. Each picture may incorporate three or more separate photographs, all taken at a different time and in a different location. Although they defy such neat categorization, many of



Pete Townshend *This subdued portrait was achieved by colour toning the original black and white print*

Exotica in St Tropez *A shot advertising jeans shows Carlos Clarke's love of stylish but incongruous images*

or horizontal photographs. His colour enlarger, a Durst CLS 450, can print negatives from 35 mm up to 4 x 5 inch size.

The quality of Bob's work has not gone unnoticed in the commercial world. In less than 10 years he has worked for many of the major glossy magazines and made advertising pictures for clients ranging from a construction company to The Who. His talents are now in constant demand and he has more than enough commercial work to keep him occupied.

Nevertheless, although Bob is delighted that more and more agencies want to use him, he feels that, if he were to allow it, commercial work could be rather a danger to his personal work simply because it is so time consuming. To give greater rein to his very individual ideas, therefore, he is beginning to strike a balance between advertising, and fine art photography and book publishing.

Following his highly acclaimed illustrations for the *Delta of Venus*, he is working on a new book, *Obsession*, with text by Philippe Garnier. But even in this kind of work, he finds he must compromise his approach to please someone. In the case of *Obsession*, it is self-appointed guardians of morality.

'My original intention was that the book should be a satirical, sensual investigation into people's private sexual fixations. But I've found there's very little you can do that makes any sense at all in terms of exposing real fetishism, real obsession. You can show grotesque close-ups of a man and woman french-kissing, but once you step out of the

defined limits, you're in real censorship trouble. Yet if you knock on every fifth door in East Cheam you'll probably find somebody doing something that is not acceptable in the eyes of the media or the public.'

His choice of sexual obsessions as a subject for a book is fairly typical. 'The first money-making pictures I did were nude features for *Men Only*, *Club International* and *Penthouse*. Working out of a grubby little dump in Brixton I used to advertise for models in the local newsagent's window—all very seamy.'

He started with nudes not only because he appreciates women but also because there was then a ready market for this kind of photograph. His attitude is completely pragmatic:

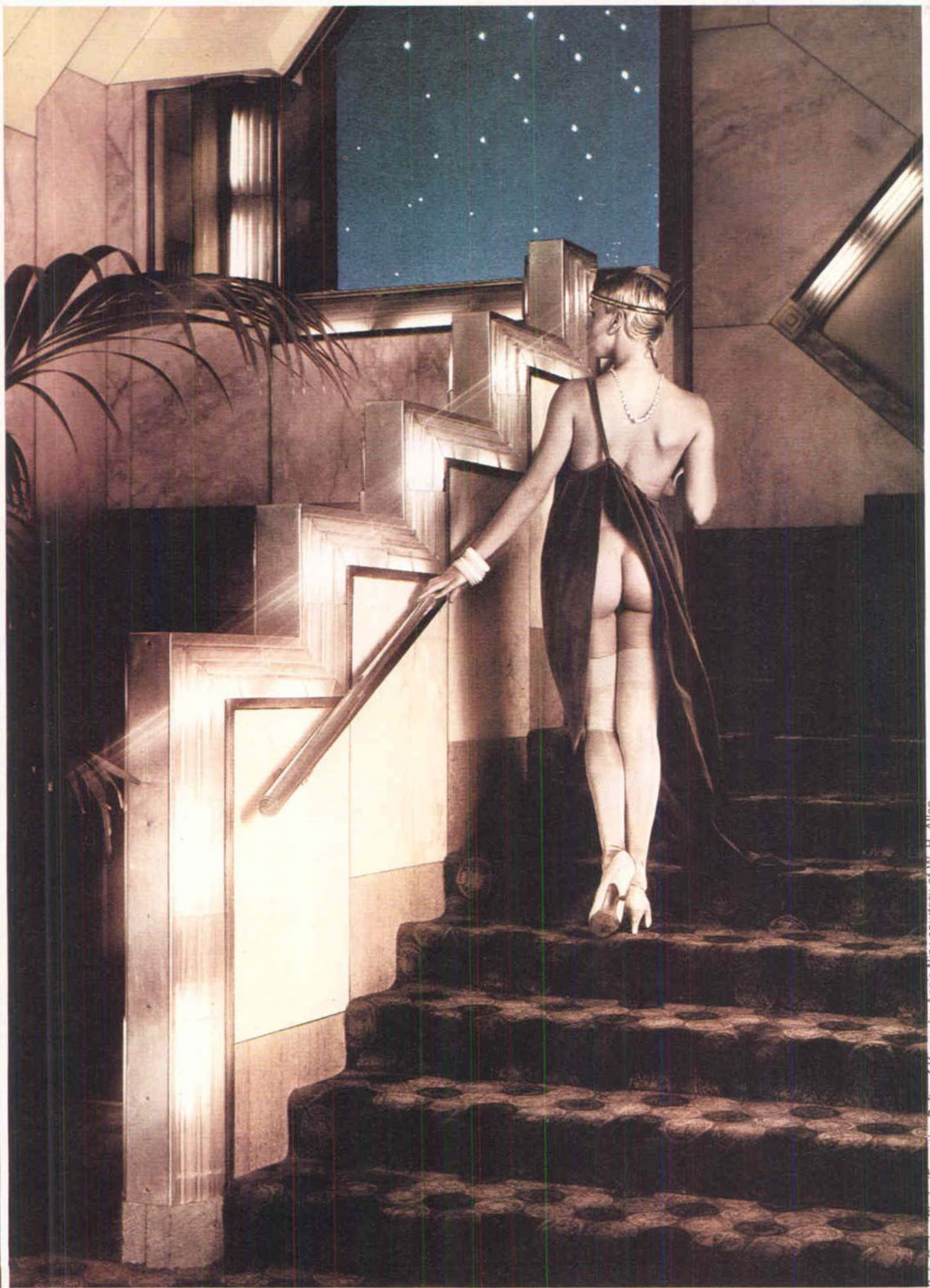
'If I'd been doing landscapes, I could have staggered around the world with my portfolio and if they'd been as mediocre as those nudes were, I would never have made a crumb!'

The fact that Bob photographs a great deal of unclothed flesh means that he





Bob Carlos Clarke



Bob Carlos Clarke/From the *Delta of Venus* by Anais Nin - courtesy of W. H. Allen

often comes in for criticism. 'Perhaps one might say there's exploitation of some of the models involved, but that would be the comment of someone who simply didn't know the workings of the process. I've never exploited anyone wittingly.'

Whatever the models feel about being photographed by Bob, they must often be surprised by the way they appear in the final picture. One of the girls may only remember being photographed in a bare studio in London, but for Bob's picture she has been transported to some weird landscape. A similar strange experience recently happened to his assistant, stylist and girlfriend, Lindsey, when Bob took a couple of portraits of her at the end of an otherwise unproductive session.

Although the pictures were over-exposed, Bob realized that Lindsey's extraordinary hairstyle could be over-

laid with a shot of a hotel at Cannes they had stayed in when photographing The Who. The result is a weird, surreal image open to many interpretations. Lindsey is obviously amazed by the transformation, 'I can't relate to it being me—she's like the madame of a brothel... she's so in control'.

There is no mystery about the technical process which Bob employs. He generally uses black and white Agfa film in the 6 x 7 camera, and makes prints on Agfa paper, which he prefers: 'The tonal range of paper is much richer than other papers.' He also uses his dwindling supply of Kodalith paper, now no longer available, which can give high contrast results.

Colour is then added using photo tints, often in an airbrush (a small scale spray gun used by artists). He masks off areas which are not to be coloured, using the frisk film favoured by graphic

artists. An alternative colouring method is to use selenium split toning, which gives brown shadow tones with a silvery grey mid range.

When asked how he manages to dream up such strange images, Bob is remarkably self-effacing: '70 per cent of the time, I don't even know myself how I construct the images—it's purely coincidental process. If you happen to have, say a negative of a waterfall in Scotland and one of a canoe in Taiwan, they can fit in together.'

Yet this reticence does not conceal the enormous care and effort that goes into his creations—a single picture may take him months to complete. Each of his pictures is not simply a photograph but an artwork, though he sometimes finds it difficult to shake people's belief that they are easy to reproduce.

'My photographs are more than just photographic prints. They're not printed on ordinary paper, they aren't produced in quantity—they're made out of separate pieces of photographs, so they're original photomontages. Some I wouldn't sell for less than £1200 or £1500, which would be a ludicrous amount of money for an ordinary photograph. I'm sure people are highly amused by what they consider to be my outrageous prices.'

Nonetheless Bob's originals appeal to an increasing number of people and each year he sells more.

'I find there's a wake behind me and people who like what I do are buying work I did two years ago. If I'm lucky they'll probably be buying the pictures I'm doing today in two years time. If I went too far I'd probably lose them altogether!'

His only worry is that his pictures are just a little too 'tasteful'. He always finds himself putting 'the gloss on the picture' rather than leaving the raw image to work for itself. 'I'd get rid of the gloss if I had the guts. I've always been neurotic about the materials I'm working with—their physical condition—one wrong spot and it would be straight in the dustbin. But you look at artists like Matisse and Picasso; their paintings are covered in dirt and rubber marks and they didn't give a damn. They knew what they were looking for and it wasn't spoiled by a couple of stains.'

But if Bob feels that his pictures suffer from his perfectionist approach, few people would doubt that it brings rewards. Bob can now afford to finance many photo sessions himself, in the hope that they will eventually pay for themselves. He also finds that some art directors, record companies, designers and private collectors now come to him to choose a completed image without previous discussion. The originality of his work has triumphantly survived both the rigours of commercial and advertising assignments, and the tastes of those who buy pictures for pleasure.

Women dreaming White make-up and skilful use of natural light have contributed to this elegant portrait



Bob Carlos Clarke



Improve your technique

Long lens lore

Long telephoto lenses can bridge the gap between your subject and a distant viewpoint, but demand careful handling and the knowledge of a few practical techniques if they are to give their best

Although many photographers think of a long telephoto simply as a lens for magnifying distant objects, lenses in the range 200 to 600 mm have a number of other equally valuable properties. With an angle of view of 12° or less, you can use one of these lenses to pick out fascinating details close by from an otherwise uninteresting scene. Or you can exploit the shallow depth of field to throw a distracting background out of focus. For the best results, however, a

long lens requires special handling.

There are more powerful lenses available with even longer focal lengths, but these are usually mirror designs with their own special handling techniques. They are described in detail in a subsequent article.

Supporting the lens

With any long lens, the camera must be kept completely steady during exposure, and even a good tripod fitted in

the camera baseplate is not always adequate. The unsupported weight and length of a long telephoto can exert considerable leverage and may unsteady the camera. The leverage may even put enough strain on the lens mount or the tripod socket to damage them.

It is essential, therefore, to support the lens as well as the camera and to make lens support easier, most long telephoto lenses have their own built-in tripod socket.

Ideally, the camera and lens should be supported by a pair of tripods, one under the lens and another under the camera. Unfortunately, this sort of arrangement is extremely unwieldy and impractical. Not only does it mean carrying two tripods around but finding a suitable site to place two tripods firmly on level ground. A satisfactory compromise is to use a single tripod and to mount both camera and lens by the lens socket, which is usually close to the point of balance of the camera and lens. Generally, this should be adequate.

If you find even a single tripod too unwieldy, a monopod screwed into the



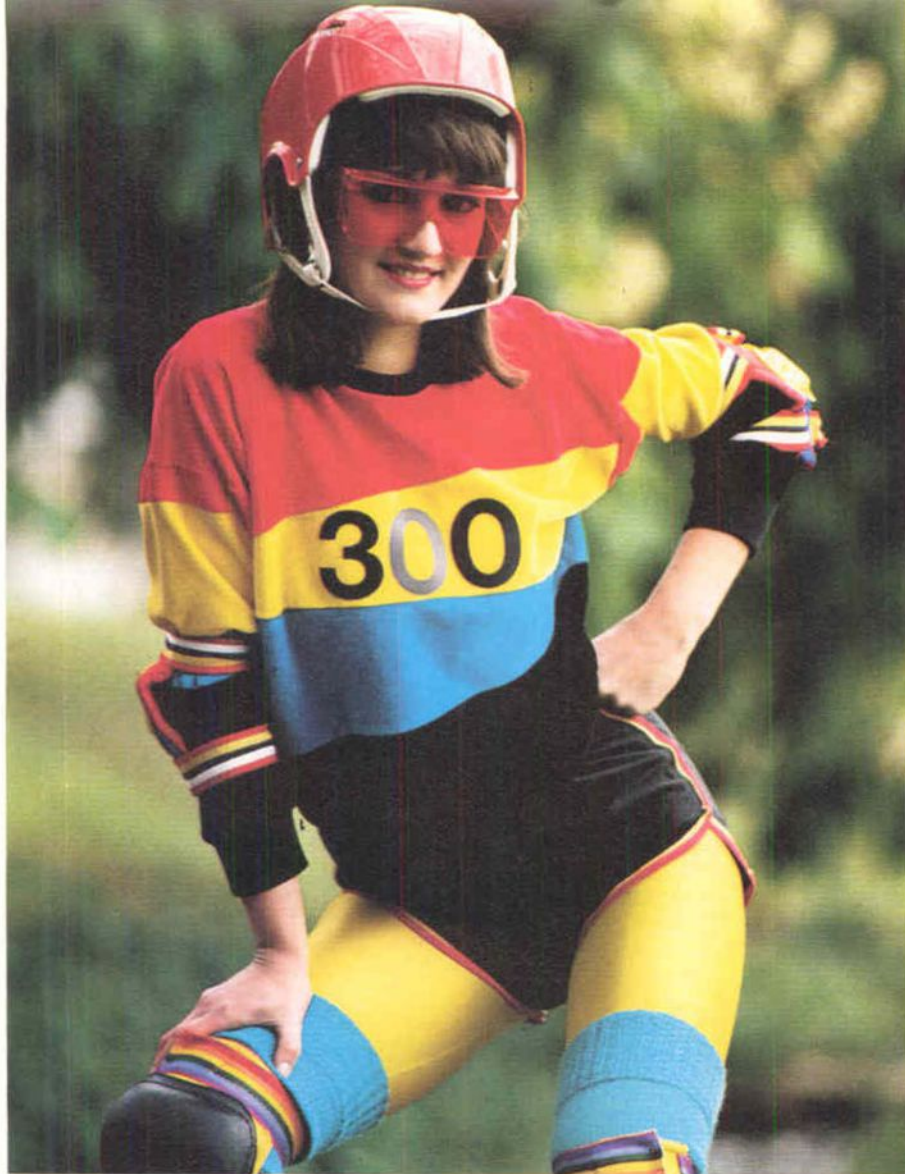
Victor Watts/Clothes courtesy Roller Rider



Victor Watts

200 mm Taken from about 10 metres with a 200 mm telephoto. Following shots show the increase in image size with larger lenses

Camera mounting Smaller long telephotos can be supported normally, but longer lenses may need their own tripod or support



Monopod To avoid the need for a bulky tripod, a 300 mm can be mounted on a monopod by its built-in tripod socket, but careful operation is necessary

300 mm From the same distance, a 300 mm lens brings the subject significantly closer than a 200 mm. The lens is just small enough to be portable

lens tripod socket may be adequate. The monopod supports the lens, and your body supports the camera. Pistol grips and rifle stocks (see page 154) can also help to hold the camera firmly. In this instance, a cable release should be used to avoid the tendency for the camera to tilt slightly when the shutter release on top of the camera is pressed.

Monopods, grips and stocks are not only easier to carry, but also make it easier to move the camera around to adjust the framing. A tripod head must be unlocked and relocked to make every small change in aim. All too often, simply relocking an inexpensive tripod head will move it slightly out of position, losing the accuracy of framing which is so essential with long telephotos.

Fitting an autowinder or motor drive adds weight underneath the camera, and this may improve the balance, as well as allowing a firmer grip.

Viewing and focusing

Long telephotos have a very limited depth of field and, although this can be a great disadvantage at first, with practice it can be used to remove distracting backgrounds and foregrounds in a controlled way. While you can easily throw backgrounds out of focus, it can require great skill to keep all the subject in sharp focus or to reach the best focus point quickly and positively, especially with moving subjects.

To ensure sharp pictures, you must focus very carefully, and it is important to keep a few points in mind. Most microprism focusing spots do not work with long telephotos, and you must focus by eye in the ground glass surrounding the microprism centre instead. Similarly, split-image rangefinders usually black out at small apertures and with a long telephoto you may not be able to open up enough for the split-image to be visible. Again, you must

Victor Watts



M. P. Kahl/Bruce Coleman

Pink flamingos Long telephoto lenses are often used to photograph wildlife. They allow greater flexibility in choice of viewpoint and framing





Lens mount A 400 mm lens needs very firm support and should be mounted on a solid tripod by the lens. This also balances the unit well

Bird in foliage The limited depth of field of long telephoto lenses can be used to creative advantage. Here it has given a moody background blur

can then check these markings against the depth of field scale.

If there is insufficient depth of field even at a very small aperture, part of the subject will have to remain out of focus (see page 86).

Presetting the focus

When shooting fast moving subjects with a long telephoto, presetting the focus is a useful way of avoiding the problems brought about by the narrow angle of view and the shallow depth of field. When covering motor sports, athletics and wildlife, for example, the rapid movement of the subject across the field of view and perhaps towards the camera can combine to make it very difficult to change the focus manually as you try to follow the subject in the viewfinder.

Instead you should pick a noticeable

400 mm Long enough to bring distant subjects in close, but too bulky for casual use, a 400 mm demands careful subject framing for good results



focus by eye in the ground glass area when using small maximum aperture telephoto lenses.

If your camera has interchangeable focusing screens, it is worth using a plain ground glass screen instead—this makes focusing by eye easier. Some camera makers produce special split-image and microprism focusing screens that can be used with lenses with limited maximum apertures, but these are usually better suited to wide angle lenses than telephotos.

When using a long telephoto on a static subject, focus with great care. If your camera has a depth of field preview control, use it to make sure that all important parts of the subject are sharp. If not, use the depth of field scale on the lens. Judge the distances by focusing first on the most distant part of the subject that you want to keep sharp, and note the setting on the lens distance scale, perhaps marking it with a soft china pencil directly on the focusing ring of the lens. Then focus on the closest part and mark this distance. You



Victor Watts

feature that you know the subject is likely to pass—a feeding table for wild birds or a mark on the road for racing cars, for example. Focus on this point and do not shift the focus even if you move the camera to view the approaching subject. You may find it disconcerting to view the subject as a total blur, but providing you press the shutter as the subject passes the preset focusing point, the picture should be sharp.

With very fast moving subjects you should also allow for the brief period that elapses between pressing the shutter release and its actual opening. Camera mechanisms take time to operate—the lens aperture has to stop down and the viewing mirror has to flip up before the shutter actually fires. In this brief instant, a fast moving subject can move past your preset focus point. It may even pass out of the frame. The shutter must therefore be fired an instant before the subject passes the preset focus point, but perfect framing needs considerable practice.

Follow focus

If you can find no preset focus point, you may have to try changing the focus as you follow the subject in the viewfinder. With a long telephoto, this can be very difficult and again the only way to perfect the technique is to practise. Football matches and other team sports give good opportunities for testing your



Sergio Dorantes

Clock face To bring architectural detail in really close, a 600 mm lens is ideal. Clarity is good even from a distance of more than 200 metres

Racing car To produce sharp pictures of rapidly moving subjects with a long lens it is necessary to pre-focus. The lens was focused on the crest of the hill

skills on fast moving, unpredictable subjects. Shooting a few rolls of film for practice purposes will help you take better pictures later.

Choosing shutter speed

With any long focus lens, particularly those above 200 mm, camera shake can be a problem and, for hand-held shots, you should use the fastest shutter speed you can. A wide aperture may sacrifice depth of field, however. In this case, use a fast film and push process if necessary (by up-rating the film speed and increasing the development time to compensate) in order to achieve an additional one or two exposure stops.

When using a lens longer than 200 mm, hand-held shots will not normally be sharp at shutter speeds of less than 1/250 second. With a 500 mm lens, at least 1/500 is necessary and it is better to use a 1/1000 or 1/2000 if possible.

Slower shutter speeds can only be used with a firm support—such as a tripod—or with the panning technique. Given a firm support, such as a monopod or a tripod with a pan and tilt head, you can use speeds as slow as 1/15 second as long as you pan smoothly and evenly.

Light and metering

For long distance shots in particular, long telephotos can result in reduced contrast, and it is worth setting the exposure and choosing the lighting



conditions that bring out the maximum contrast in your subject.

When using slide film with a long telephoto, it is usually best to give the minimum acceptable exposure. A slide that is slightly denser than normal may appear to have improved contrast and definition. Similarly, slight underexposure combined with overdevelopment can improve the contrast of black and white telephoto pictures.

Even in low light you should still aim for minimum exposure. At concerts and shows, for instance, try to base your exposure readings on the performers rather than on the stage as a whole. An average reading will make the picture look grey and the performers washed out. It is better to have good contrast and a pure black for all the shadows than to try for an exposure that gives good shadow detail. Fortunately, the narrow angle of view of long telephotos combined with through the lens metering makes it easier to take selective readings from small areas of the subject. Simply move in close enough to fill the frame with your subject and use the reading taken at this distance as the basis for exposure of the whole view. If, however, you are forced to take a distant viewpoint—say at the back of a large concert hall—exposure setting may be more difficult. If you have to record the whole of a dimly lit stage rather than a single spotlit performer, the indicated meter exposure will have to be corrected by stopping down slightly.

Choose subject lighting carefully. Side or backlight will appear to increase sharpness. Flat frontal lighting or dull light will reduce it. Subjects picked out in full light against dark backgrounds

Two tripods With very long lenses, extra precautions are needed to ensure stability. Tripods under lens and camera eliminate shake

600 mm For a tight close-up from a distance, a 600 mm is hard to beat. Powerful lenses are usually mirror designs to reduce overall length



Victor Watts



Victor Watts

will look sharper as well. In these circumstances be especially careful to avoid lens flare. Long telephotos can be fitted with very deep lens hoods, often deeper than those supplied with the particular model. You may be able to improvise an effective lens hood from cardboard tubes painted black inside.

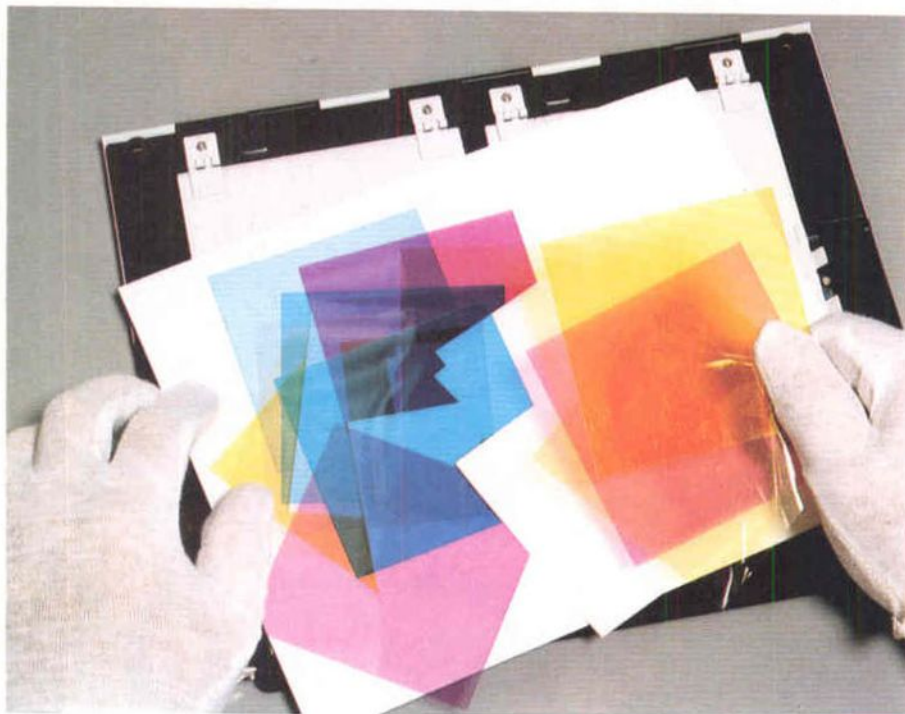
Finally, sunsets or moonrises are ideal subjects for long telephoto lenses, particularly if they are the main points of interest—a long lens helps to ensure that they are not tiny spots in a vast frame. You should always be extremely careful when viewing and photographing the sun, however. Even when the sun is low on the horizon and dim enough to look at without discomfort it may still produce enough heat to damage your eyesight permanently. It may also damage your camera's viewing system. So, when photographing the sun, point the camera at the sun for the briefest time necessary for framing and metering. A straightforward through the lens meter reading will usually be correct, but bracket exposures a stop on either side of the 'correct' reading in any case. Each exposure setting will change the mood and colour of the final result, and give you a wide choice of effects in the final pictures.



Darkroom

Colour printing - 2

You can learn a great deal about colour printing from your first few colour prints—especially if you establish from the start a routine that enables you to progress quickly to a finished print



Processing colour prints requires a little more precision and care than processing black and white prints, but but the real challenge of colour printing lies in making the exposure correctly. It is at the exposure stage that you must use filters to achieve the right colour balance. Yet although the theory behind colour balancing may seem dauntingly complicated, it is, in practice, surprisingly easy to master.

When you start to print in colour, it is useful to have a reference print. For your first print, use a negative that you know has been properly exposed and has a fairly typical range of colours. You may find it hard to identify such a negative simply by looking at it—even the most experienced darkroom technicians cannot always spot a poor colour negative instantly; so it is worth having professional prints made of a few of the most suitable negatives. This not only helps you to decide on the best negative, it also shows the kind of colour balance you should be aiming for. You might even be able to improve on the professional version.

Proper exposure of a colour print requires two main calculations to be made: the correct exposure time and the correct colour filtration for each negative—unlike in black and white printing where the main test is just for print

Filter pack Coloured printing filters can be used to correct the colour balance of colour prints. A sandwich of several may be needed to correct a cast

exposure. But you will almost inevitably have to make minor adjustments to the exposure time after you have decided on the colour filtration.

Timing the exposure

To work out the correct exposure time, you make a test print in much the same way as you would for a black and white print. This first test print is used only for calculating exposure time and needs no colour filtration—it is sometimes called a zero print or basic print because there is zero filtration.

Begin by inserting the chosen negative into the enlarger in the normal way. Then adjust the size, focus and composition of the image. Switch off all lights, take out a sheet of printing paper and place it carefully on the baseboard. If you are drum processing, it is best to use an entire sheet for the test since it can be difficult to process in some types of drum anything less than a full size print. Even if you use the dish processing technique, it is probably better to use a full sheet because your exposure estimates are more likely to be accurate if based on the whole photograph.

With the paper in place on the baseboard, you are ready to begin test exposures. These are made in exactly the same way as black and white test strips (see pages 164-167) except that colour print paper is more sensitive and needs less exposure. Exposure times for colour prints are roughly half those for an equivalent enlargement in black and white. Nevertheless, there is less margin for error with colour and you usually need to make two exposure test prints: the first embracing a wide range of times to give a rough guide; the second to give the precise exposure needed.

Once you have exposed your test print, process it in the manner described on pages 546 to 549, taking particular care not to cross-contaminate any of the solutions. You can pick out the segment that has the best exposure while the print is still wet, but, to be absolutely sure, wipe off surplus moisture and dry the print before deciding on the exposure time.

Just as in black and white processing, areas of the print that are generally too dark have been exposed for too long; those that are too light have not been exposed for long enough. The correct exposure time lies between these two extremes.

When you are assessing the exposure, you will probably notice that the colours on the test print are not quite right. This does not mean that you are doing something wrong. Almost inevitably, an unfiltered print is biased towards a particular colour—it has a *colour cast*. This colour cast is most obvious in those areas of the print that should be white or neutral grey. The ideal negative, in combination with the ideal enlarger and the ideal paper, might produce a print with perfect colour balance without any filtration, but such a combination is rare. To obtain good colour, filters are invariably needed.

Filters for printing

Filters are placed in the enlarger to alter the colour of the light falling on the printing paper. The actual exposure can be made in one of two ways—by using the *additive* or *subtractive* methods of colour printing.

For additive or *tricolour* printing, just three filters in the primary colours of blue, green and red—are used. Adjustments to the colour balance are achieved by making a separate exposure through each filter and varying exposure times. Because of the problems asso-

ciated with the triple exposure, additive filtration is less popular nowadays and this article concentrates on the widely used subtractive method. Nevertheless, additive printing is useful for some special darkroom techniques and is explained in a subsequent article.

For subtractive or *white light* printing, only one exposure is needed. Colour correction relies on combinations of filters in the complementary colours: yellow, magenta and cyan. It is called 'subtractive' printing because the filters subtract or filter out a particular colour—yellow takes away blue, magenta takes away green and cyan takes away red. Remember, though, that printing paper works in much the same way as colour negatives and the positive printed image is simply a negative of the negative. A yellow filter, therefore, reduces the blue light falling on the paper. Less yellow dye is therefore formed in the blue-sensitive emulsion layer, and so the print image appears more blue.

The amount each filter gives depends upon its strength. If you have an expensive enlarger with a *colour head*, you can dial in any correction value you want, but most amateurs use individual filters of different strengths slotted into a *filter drawer* on the enlarger. Each filter strength is given a number; a low number indicates a weak filter; a high number indicates a strong filter. Filters are very pale in colour, despite this

they take away a significant proportion of their complementary colours—for example, a 50 yellow takes away 70 per cent of the blue light—and this has a considerable effect on the print image. A typical filter set consists of about 20 filters ranging in strength from 05 or 10 to about 100. Combining two low density filters gives the same effect as one high—a pair of 10 magentas is the same as a single 20 magenta, but you should always use as few as possible.

The combinations of filters are arran-

ged into a *filter pack* for slotting into the filter drawer on the enlarger, and the delicate filters are often sandwiched between two glass plates.

The composition of the filter pack is usually described in the sequence yellow, magenta, cyan. A pack consisting of a 20 yellow and a 10 magenta, for example, might be written as (20 10 —), where the dash indicates that no cyan filter has been used. It is well worth using this form to write down on the back of each print information about

Exposing a colour print



1 Prepare your enlarger in the normal way taking the usual precautions to see that the negative and its carrier are free of dust and hairs



2 Place a UV absorbing filter in the filter drawer of your enlarger. This can be left permanently in place here (or elsewhere if required)



3 Size up and focus the image, turn off all lighting and make a zero test print (— — —) for a range of exposures, such as 5, 10, 15 and 20 secs at f/8



4 Process the print. While you can judge print density quite accurately when the print is wet, colour balance can only be judged when the print dries



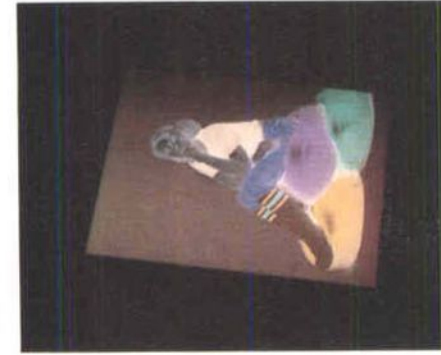
5 The correct exposure in this instance is about five seconds. This time forms the basis of all subsequent exposures, and so must be accurately established



6 The first filter pack should consist of filters which match the cast on the zero print. Alternatively, use the basic filtration printed on each paper pack



7 Process and wash this filtration test print carefully. Examine the dried print under good lighting—preferably daylight—for corrections



8 Continue making test prints until you are close to establishing the correct filtration, then make a fully corrected print (here, 145Y 85M 00C for 28 secs)

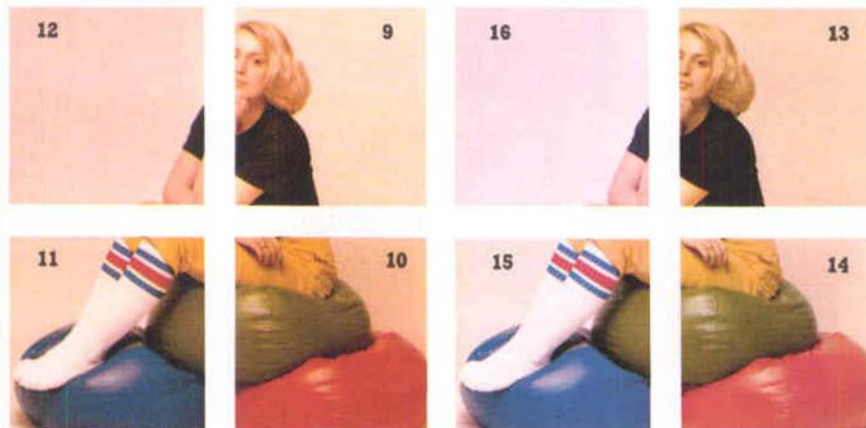
Getting the right colour balance

If possible, spend a little time exploring the various filtration possibilities when making your first few prints. Here, starting with a zero print (— — —), you can see the gradual progression to a fully corrected print



1 (— — —) 5 secs, density slightly light. 2 (— — —) 10 secs, slightly dark. 3 (— — —) 15 secs, too dark. 4 (— — —) 20 secs, too dark

Broad-range filtration to counteract orange cast: 5 (80 60 00) 14 secs. 6 (90 60 00) 14 secs. 7 (100 60 00) 15 secs. 8 (110 60 00) 17 secs



Further correction required: 9 (110 60 00) 17 secs, to continue from quadrant. 10 (110 65 00) 23 secs. 11 (120 65 00) 24 secs. 12 (120 60 00) 21 secs

Using segment 11 for continuation: 13 (120 65 00) 24 secs. 14 (130 65 00) 24 secs. 15 (140 65 00) 24 secs. 16 (150 65 00) 24 secs—too much yellow out



Improve on quadrant 15 by removing more magenta: 17 (140 70 00) 25 secs. 18 (140 75 00) 26 secs. 19 (140 80 00) 27 secs. 20 (140 85 00) 28 secs

With just a trace of additional yellow filtration—producing a new filter pack of (145 85 00), exposed for 28 secs—full correction is obtained

the filters you used. There are other notation systems, however, and you may see filter packs described in the form: CP20Y + CP10M. This is exactly the same as (20 10 —); CP stands for Colour Printing filters and 20Y stands for a strength of 20 yellow. Two scales of filter values are in common use. Values of the Agfa scale are approximately 50 per cent above those of the Kodak scale. For example, a 75 Agfa filter is equal in strength to a 50 Kodak filter. Unless specified otherwise, you can presume values are from the Kodak scale whenever a sequence of filter values is quoted. Do not presume, however, that all filter values are in the commonly used Y M C sequence (as used by Agfa, for example). Kodak quote figures in the reverse order, C M Y. Stick to one or other of these two orders.

An important additional component of the filter pack is an ultraviolet absorbing filter such as the Kodak Wratten 2B. This ensures that the small element of ultraviolet light from the enlarger does not affect the print. To save yourself the effort of inserting it into the pack each time you make up a new combination, the ultraviolet filter can be left in the enlarger permanently, taped to the top of the condenser or light box. If your enlarger tends to run hot, you should use a heat absorbing filter to protect the negative and the colour correction filters. Exposure to excessive heat over a long period may cause dyes to fade.

When you change paper

When you change to a new batch of paper there is no need to repeat all your tests. You can work out the new filtration by subtracting the old paper adjustment from your filter pack, then adding the new adjustment. Plus or minus values are quoted by Kodak, whereas Agfa quote a basic filter pack. If, for example, you used (145 85 —) filtration and paper with the adjustment +10Y —10M, a new batch of paper with the adjustment +15Y —05M requires (150 90 —) filtration. The new exposure is worked out by multiplying the old time (say 28 secs) by the new paper factor and dividing by the old factor (70, below). This gives a time, in this example, of 32 secs if the new paper factor is 80



Which combination?

The appearance of the test print made for exposure time—the zero filtration print—gives some idea of the kind of correction that may be needed. Once you are very experienced you may be able to gauge the combination of filters needed for correct colour on the basis of the exposure test print alone. But to start with, you will probably need to make further tests.

When deciding on the filtration that each negative needs, the most important point to remember is that you remove a colour cast by adding a filter of the same colour to the filter pack. A yellow cast, for example, would be reduced by a yellow filter. Colour casts in colours other than the complementaries are reduced by using appropriate combinations. Red is half way between yellow and magenta, so a red cast is corrected by yellow and magenta filters of equal strength. For an orange cast, a slightly stronger yellow and a weaker magenta is needed. To correct for a strong cast, strong filters are needed; for a weak cast, only weak filters are needed.

Every colour cast can be corrected by using just two filters out of a set of two out of the three filter colours; using three simply reduces the light intensity. If you find yourself with a combination of three filter colours, simply remove the weakest one and deduct the strength of the colour you have removed from the other two. A (60 20 10) should therefore be adjusted to a (50 10 —). This has exactly the same effect on the colour balance.

You should also try to use as little filtration as necessary. Make adjustments by removing filters if possible, because filters reduce the amount of light falling on the paper and so affect exposure. Adding a filter usually means increasing the exposure by an amount corresponding to the strength of the filter.

Try also to use a single high value filter rather than a number of low value filters. For a 50, for instance, a single 50 filter is better than a combination of 20 + 20 + 10.

Test prints

There are two factors to bear in mind when deciding what filters to use for the test. First, every batch of paper has slightly different colour response; the filter combination needed to correct any bias is usually marked on the packet. Second, uncorrected, the tungsten light of the enlarger bulb gives a red cast to the picture—yellow and magenta filters are required to correct this. Correction for the paper and the reddish cast, then, can provide your starting point for tests.

To save time and expense, you can make four separate filter combination tests on a single sheet of paper, using a quarter of the sheet for each exposure. In these *quadrant* tests, four separate exposures are made using different combinations of filters. For each exposure, three quarters of the print are masked off while the fourth is exposed.

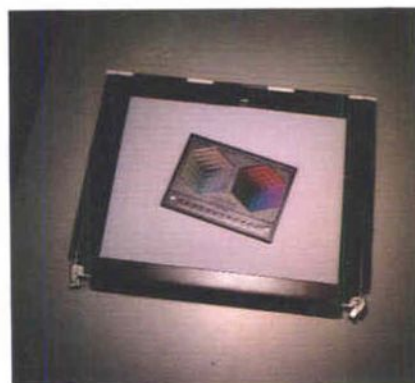
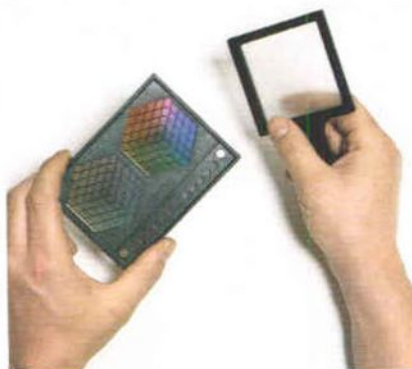
topic

Filtering aids

If you have real difficulty working out the filters needed to correct a cast, you may find so-called filter mosaics or matrices provide a useful short cut. The Unicolor/Mitchell Duocube shown below is typical and widely available. It is composed of two matrices of colour printing filters, together with an exposure scale. The device is laid on contact with a sheet of paper and is exposed to the diffused image of the negative. The theory behind the use of a device such as this one is that an ideal 'average' scene contains equal amounts of all visible colours (white light). In theory, if white light is used to print a negative the resulting image, when diffused, should remain white, or neutral grey. But the quality of the printing light

normally has to be adjusted in order to produce this neutral grey. This is done using the appropriate correction filters. Devices such as the Duocube employ specific filter combinations (122) and one of these will normally be sufficient to correct the printing light. You simply read off the filter combination which corresponds to the most neutral looking grey on the contact print image, add this to your filter drawer and make a corrected print. Obviously the theory does not hold true if you use a shot containing a large area of one colour. But the makers point out that about 90 per cent of all scenes should diffuse to a neutral grey (which, incidentally, is regarded as a dark white). To be successful, you still have to make the first few exposure and filtration tests to establish the correct control prints for your later work.

Clear instructions are provided.



Two main quadrant tests are needed: one to establish the strength or *density* of the cast; the other to establish the precise colour of the cast.

When making these tests you must remember to adjust the exposure time to take into account the absorption by the colour filters. Manufacturers supply tables for various filter permutations and all you have to do is read off the exposure factor for a particular combination of values. Multiply the basic exposure by this factor to obtain a corrected printing time for each of these filtration tests. Later, whenever you change filtration, remember to apply any necessary exposure correction.

Process the print and wash and dry it carefully before making any assessment—if possible in normal daylight or under the type of lighting which will be used for viewing the final print.

Usually, one of the quadrants will show roughly the correct colour balance. If not, then you must repeat the density test with different filter packs until you find roughly the right combination. Once you have established roughly the right combination, you can move on to the second test using slight variations of this combination.

Fine tuning

The second test is essentially fine tuning to establish the precise colour cast. However, there is usually a hint of second cast in another colour and the

second test also establishes the filter combination to correct this. This stage is explained in more detail in a subsequent article because, even although the principles of colour correction are exactly the same, the noticeable but slight colour casts can sometimes be extremely difficult to isolate and need special techniques to correct.

However, you can make a useful practical start by making simple, low value corrections to the filter pack which give the best density correction of the main colour cast. If, for example, a reddish cast is corrected for red but shows a tinge of magenta in the resulting print, you can either add a little extra magenta filtration or increase the proportion of magenta by removing a corresponding amount of yellow filtration. There is a slight difference if you compare the colour balance of the two prints that result. Try to keep your experimental corrections to low value filters (05 and 10).

The main print

When you have established the correct filtration for your negative, apply the necessary exposure corrections and make the print. If possible, produce two, and keep one safely stored for reference purposes. Make a special point of writing all the exposure information on a label stuck to the back of this print, including details of the paper you have used (see panel).

Indian railway

Antiquated steam locomotives, glimpses of unfamiliar faces and the changing scenery, all combine to make an Indian railway journey a memorable experience



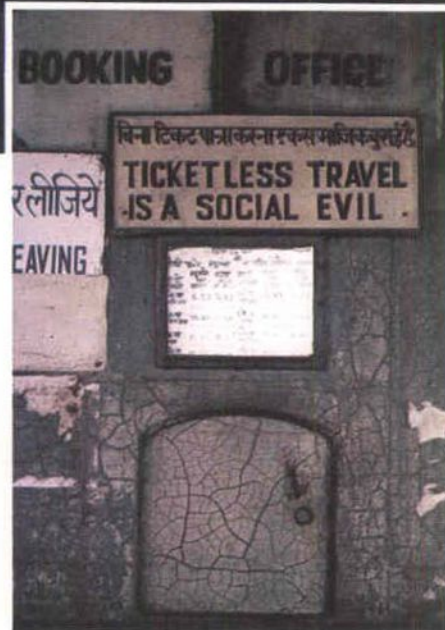
Travel on an Indian railway offers almost unlimited subject matter. The age of steam still lives on in this part of the world and the sight of old steam engines gives a sense of having travelled backwards in time. Further, the tracks traverse large stretches of scenic country well away from roads and towns, and the stops along the way allow a glimpse of unfamiliar faces and ways of life. The focal point of George Wright's assignment was the hubbub of daily life in and around some of the many railway stations.

A journey to a distant country always requires a lot of planning—particularly when photography is involved. All of George's equipment was thoroughly checked before departure and he purchased one hundred rolls of Kodachrome, fearing that it might not be readily available in India. Most of the equipment was packed into a strong Billingham bag—two camera bodies

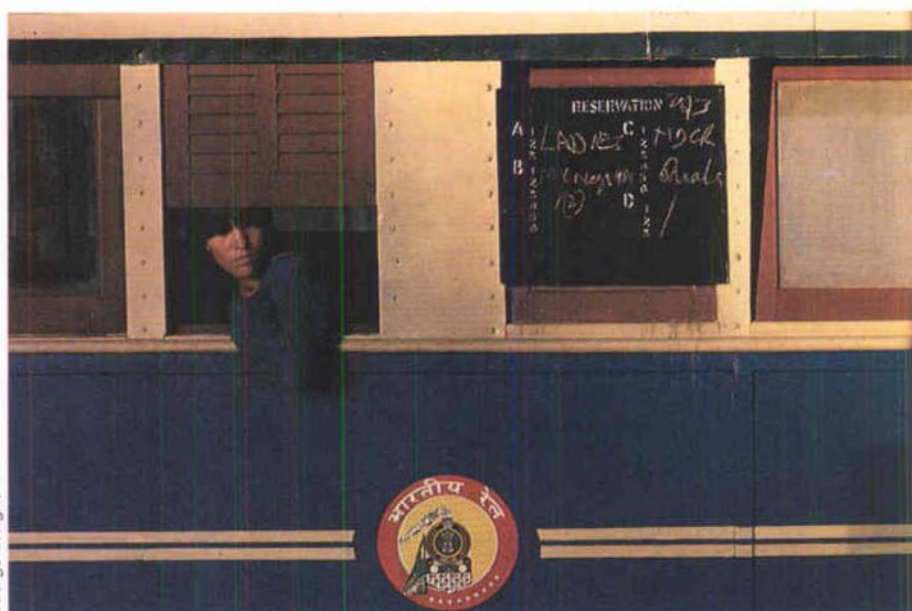
George Wright



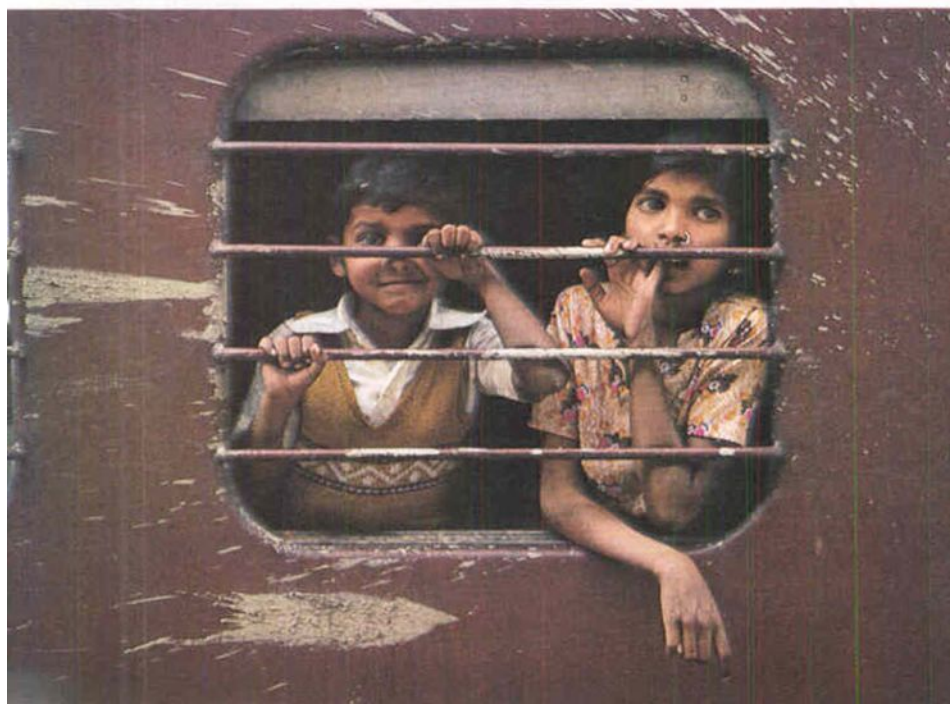
Engine crew George always found it best to ask before taking shots of people. For this one he used a 105 mm lens to close in on the engine driver and crew



Social evil Good photographers are always on the look out for amusing details like this. The ticket office was actually closed!



George Wright

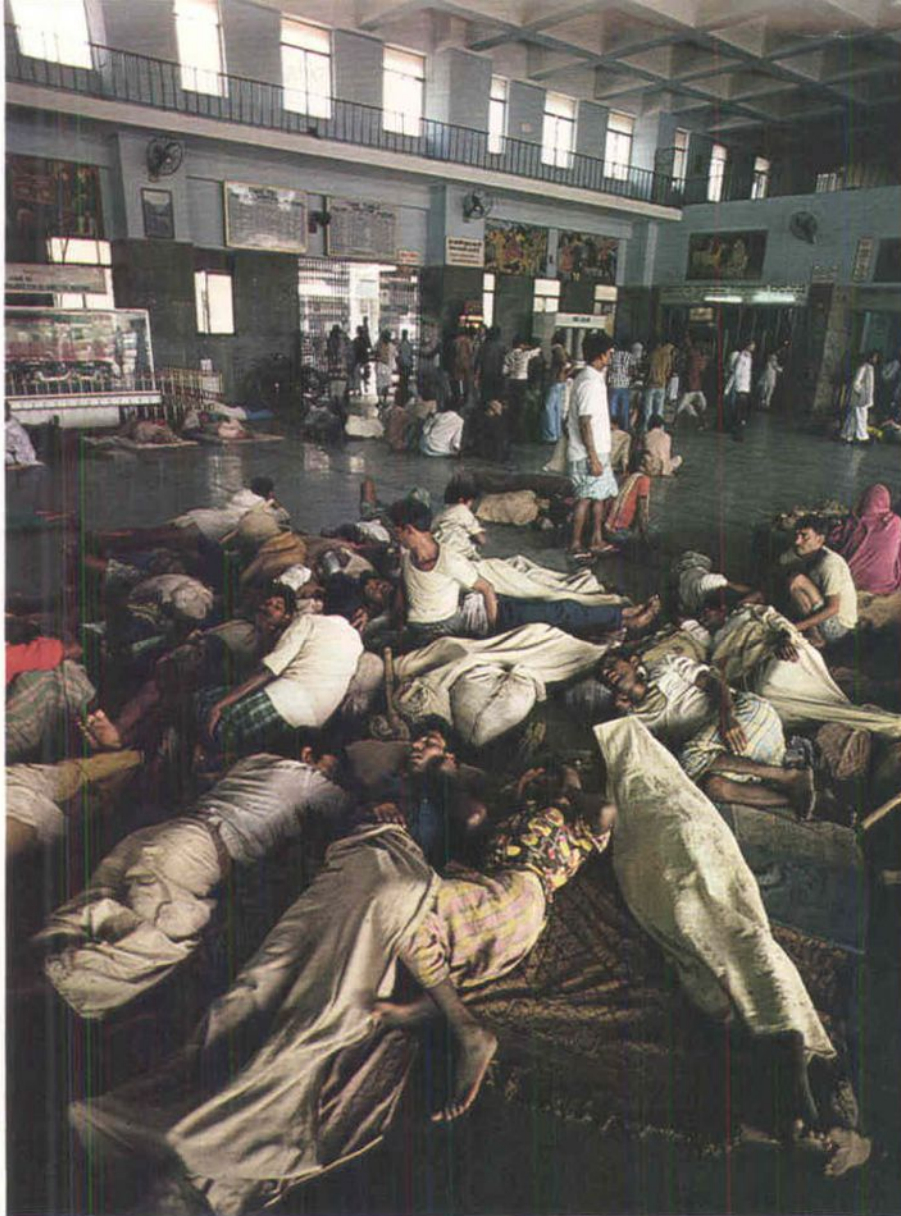


Foul weather (far left) George used the cloudy background to add mood to this shot of a solitary walker at Simla, where the railway reaches 3,000 metres above sea level

All aboard (top) Being very careful not to miss his train, George stayed on the platform during long stops so that he had the opportunity to photograph the people as they boarded the train

Looking out (above) People staring out of windows is a popular theme. Here, the girl is the focus of attention, colours of the carriage and the emblem create extra interest

Two children Using a window as a natural frame, George closed in on the railway carriage, and featured the children's faces and hands to create this strongly composed shot



Waiting room A comment on Indian railway travel. George underlined this with a shot of people waiting for the next train

Water carrier The golden light that envelopes the water carrier is a delightful feature of this shot taken with a 300 mm lens

Railway carriages During one of his train journeys the pace was so slow that George actually stepped off to take this wide angle shot



George Wright

and 20, 28, 105 and 300 mm lenses.

Much of the atmosphere of a particular place is conveyed by the faces and activity of the railway travellers as well as the buildings and machinery. Bearing this in mind, George spent much of his time photographing people in relation to the railway. Just about everyone he approached was delighted to allow themselves to be photographed—George usually asks before taking photographs of people, unless doing so would spoil the spontaneity of the shot. George found that he was free to wander around as he wished but one problem he discovered was the initial impulse to photograph almost anything and everything. He attributed this to the novelty of the surroundings and the sheer amount of interest in everything he looked at. Disciplining himself to be more selective George began to look at the scenes more carefully and to probe deeper into his subjects. Choosing his subjects with care and picking just the setting he wanted helped George avoid the trap of trying to cover too much ground. In this way, he managed to capture a definite taste of railway travel as opposed to simply making a series of random passing shots.



The London Marathon

Over seven thousand runners of all ages taking part in a marathon race through London is an incredible sporting, as well as photographic, challenge



When over seven thousand competitors get together to run a marathon through the heart of a city, the prospect of photographing such a huge event can be as daunting as the race itself.

Jack Burnicle, a photographer mainly noted for his Motocross shots, knew that he would have to plan his tactics almost as carefully as the athletes themselves. Apart from the start and finish sections, which are essential from an assignment point of view, Jack also wanted to cover the intermediate stages as he felt that these would yield many more unusual and interesting shots. Shooting from three different places on the route, all a long way apart, presented difficulties—especially as many roads in the area were closed to traffic on race day.

Planning ahead, Jack took a look at the course before race day to find good vantage points and to decide how best to get from one point to another. Jack selected a viewpoint, a multi-storey carpark, overlooking part of the course. This, he thought, would also overcome the practical difficulty of seeing over the heads of the many thousands of spectators who were expected to line the course. Anticipating such things is typical of a

The start Jack thought that a shot of the start was essential—the sight of over seven thousand massed runners could not be missed. Poor weather and very little light made it difficult to make good use of colour or to get enough depth of field with the 135 mm lens

professional approach to an assignment and brings many more rewards than simply turning up on the day not knowing what to expect.

Marathon day dawned wet and overcast, conditions which usually prove problematic for the colour photographer. In order to make the most of the colour he found, Jack used Ektachrome 64 transparency film. This is excellent for producing sharp and pleasing colour shots but it has its limits for action photography—especially when the light is poor. Nevertheless Jack knew that he could uprate the film if necessary.

To allow for the slow film and the low light level, Jack chose his faster and shorter telephoto lenses to isolate the main subjects—an 85 mm *f*/2 and a 135 mm *f*/2.8 were the most useful, offering relatively fast apertures and hand-holding capability. With these



Jack Burnicle

Jack Burnicle



lenses fully open, Jack could choose shutter speeds that would freeze the action while also cutting down the chance of camera shake.

Speeds of 1/125 or 1/250 second are sufficient, but Jack would have preferred to use a shutter speed of 1/500 second to ensure absolute sharpness had his film allowed it. For some longer shots Jack used a 200 mm f/4 on his two Nikon FM bodies but he found no use for anything longer and the widest lens he took along with him was a 50 mm standard lens.

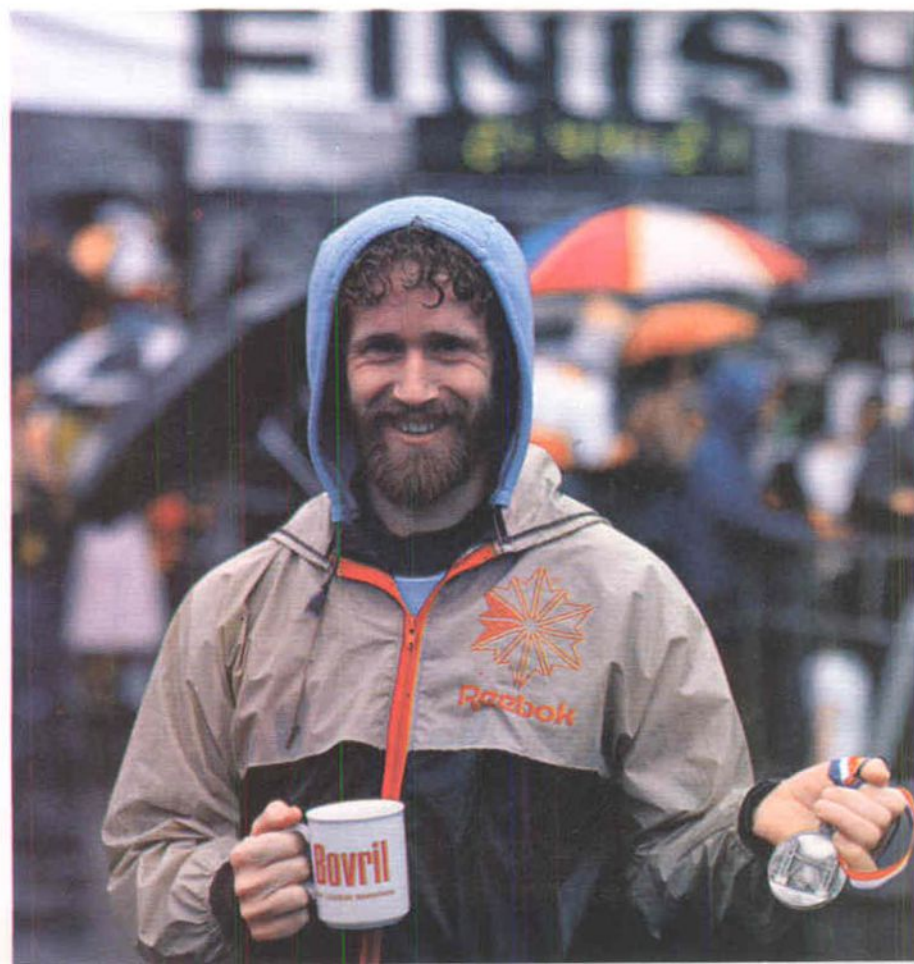
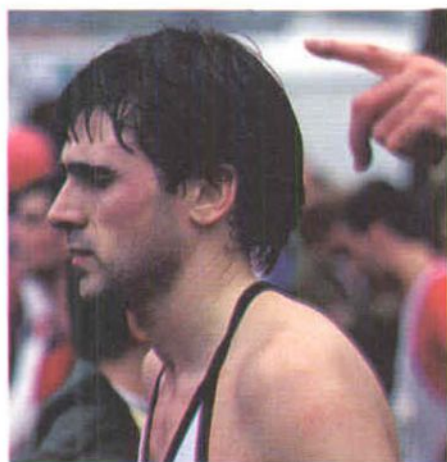
After the shots taken at Tower Bridge, midway through the marathon, Jack rushed to the finish line in his car in time to get into position to photograph the leaders. After the first runners had crossed the line he found that there was more going on behind the scenes. There, the exhaustion and emotion created a compelling scene. Cold, wet heroes, barely able to stand, clutching hot drinks or proudly holding up medals—there was plenty to hold Jack's attention.

For most of the time Jack found that photographic subjects presented themselves to him. Naturally the runners themselves occupied most of his time during the race, but he also looked to the crowd to add some variety to his coverage of the event. The crowd seemed to be such an important part of an event like this that they could not be missed out. They were so absorbed with cheering on the race that they did not notice Jack busy photographing their gestures and expressions. He also talked to some of the participants after the event and took a few posed shots.



Crowd (above left) A shot of the crowd helped Jack to include some extra colour. **Looking down** (bottom left) From a pre-selected viewpoint, using a 200 mm lens to fill the frame with part of Tower Bridge, Jack caught an interesting shot of the leading runners. After, he used the 135 mm lens for a close view of the runners as they were crossing the bridge. Both shots are effective—one showing the runners in a particular setting and one as a study of the runners themselves

Arm-in-arm Shots of runners could have become repetitive without some variety. Here Jack found an extra point of interest—two runners crossing the finish line arm-in-arm. **Authoritative finger** After the Marathon distance an exhausted runner is caught by Jack's camera as he is directed away from the finishing line. In the area behind the finish Jack found plenty to photograph—a weary looking profile and a proud runner holding up his medal, with the 'FINISH' barrier carefully included





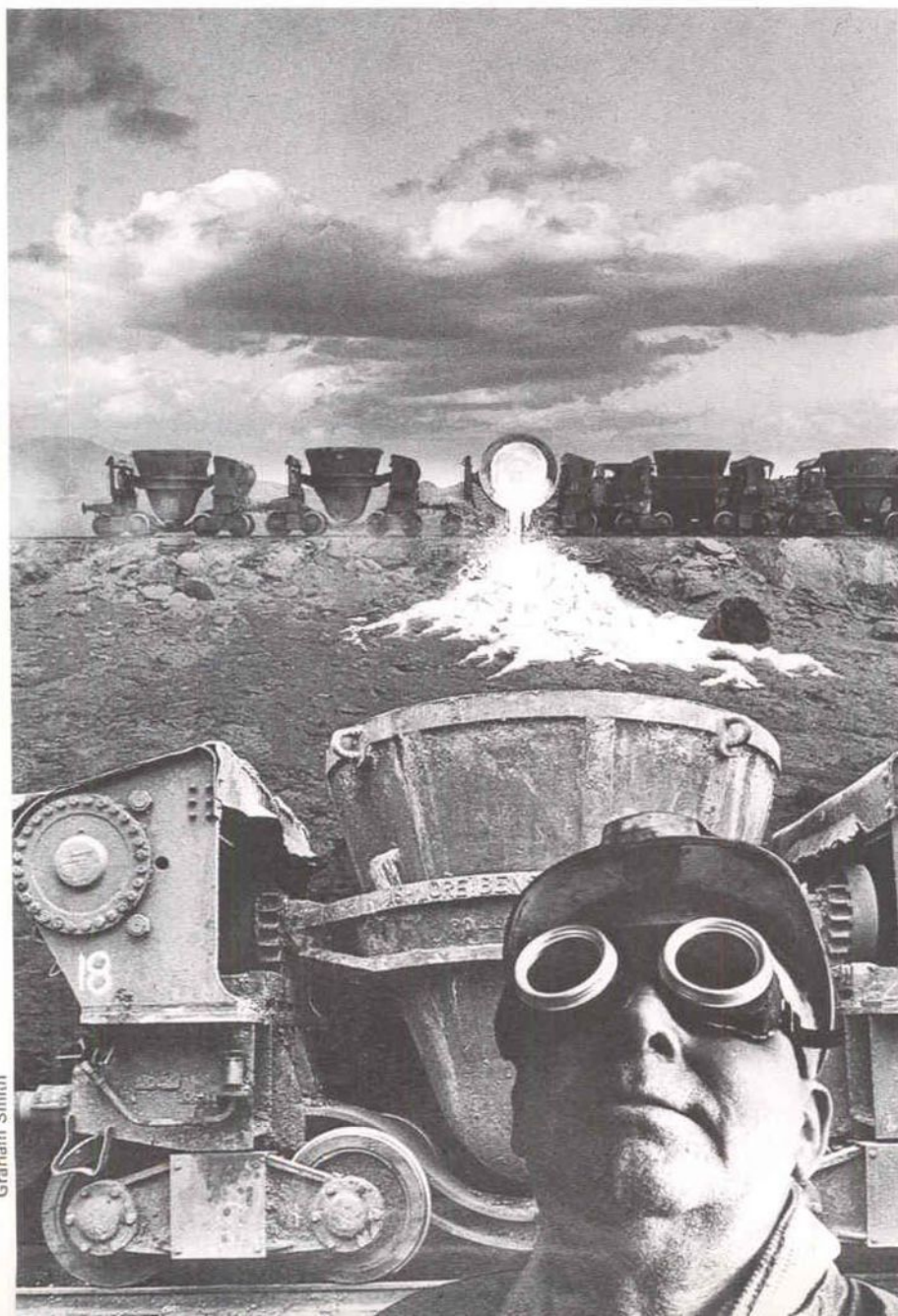
Darkroom

Simple montages

Scissors, a scalpel, glue and some interesting prints or cuttings are all you need to make a start with a simple image making technique—photomontage
Have fun—and let your imagination run wild

Of all the techniques available to the photographer, few provide more scope for both serious creative work and sheer fun than photomontage. By simply cutting out selected areas of prints and pasting them down on others, you can create a wide range of pictorial effects without even moving from your room.

Obviously, the effectiveness of each montage depends upon your choice of pictures and your skill in cutting them up and pasting them down. Once you have mastered the basics, however, the potential for photomontage is limited only by your imagination and the materials you choose to use.



Graham Smith

When you assemble a montage, you can take one of two approaches: you can either try to disguise the joins between the various elements, suggesting that the picture is a single photograph; or you can deliberately show up the joins using a rough cut technique. Rough cut montages are undoubtedly easier to make because they need less skill and care in cutting and pasting, though the results can often be very satisfying. Deliberate emphasis of the difference between the various elements of the montage lends a surreal quality often exploited by modern cartoonists.

Rough cut

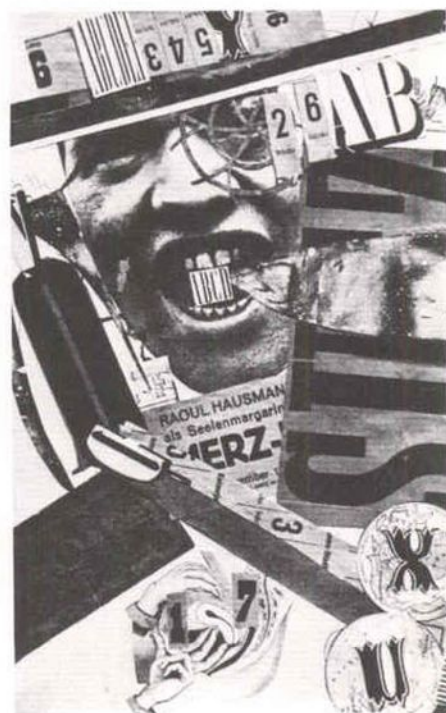
When you first start to make a montage, it is a good idea to select a photograph to provide the background first and then try superimposing a variety of subjects on it. As you become more skilled at judging suitable montage material, you may prefer to work the other way round, looking for backgrounds to suit a chosen subject.

Once you have selected the background photograph, make a print large enough to work on easily—at least 50 cm x 40 cm—and mount it on stiff card. The other images are eventually pasted on to this print, so make as neat a job as you can.

After you have made the background print, you make prints of the other images that are to be mounted on to it. These prints must be correctly pro-

Smelter Although simple principles are involved, this montage is a combination of several images which form a coherent and interesting arrangement

'A B C D' 1923 A montage—almost a collage—of cuttings and photographs make up this image. You could do much the same using photos and newspapers



Raoul Hausmann/Ikon

portioned to the background to create the effect you want. If you wish to mount a series of figures realistically on to a recognizable background, for instance, the prints of the figures must clearly be the appropriate size. To make sure you get the size right, cover the background print with tracing paper and trace the outlines of the main features in felt tip pen. Be careful not to press hard with the pen or you may mark the print. Place the finished tracing on your enlarger baseboard and project your chosen subject negative on it.

Move the tracing paper around until the chosen area of the subject negative is projected in roughly the right place and then adjust the height of the enlarger until the size of the projected image is right. You may have to repeat this process a number of times before the image falls exactly right. It is possible to dispense with the tracing and make your adjustments on the background print itself but it is very difficult to see the projected image of the negative clearly against the detail of the print.

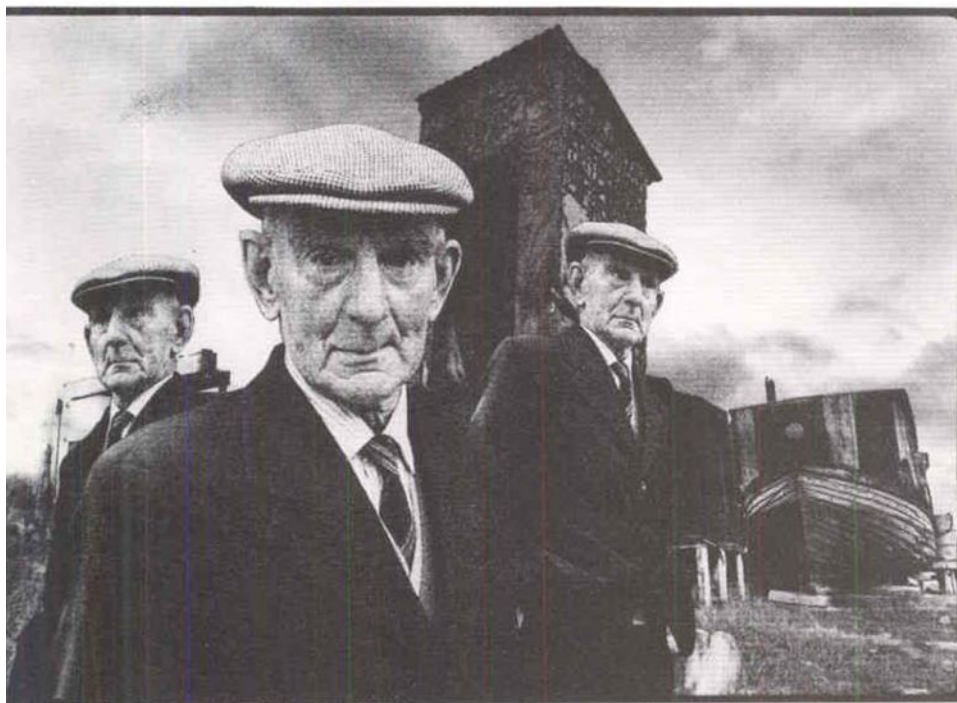
When the projected image is the right size, remove the tracing or print from the baseboard and make a number of prints from the negative—it is usually worth making two or three in case of mistakes while cutting. You do not need to print the entire negative, only the areas you want for montage. The prints are processed in the normal way but make sure the final wash is done

Title page *Even at its simplest, a cut and paste montage can convey a visual message that is not possible in a straight photograph*

Three of one *A very effective montage which combines several print images shot specially with this montage idea in mind*



John Heartfield/Ikon



Graham Smith

thoroughly since any chemicals that remain on the prints may affect the glue used for montage work.

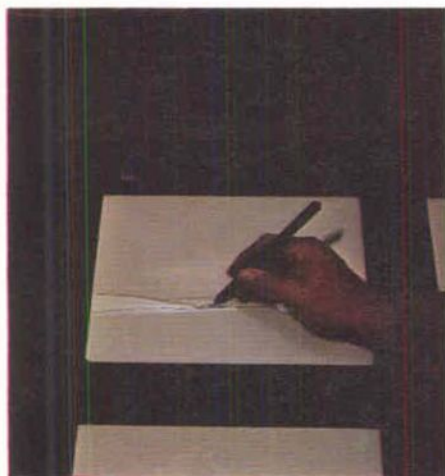
Place one of the finished prints on a cutting board and cut carefully round the chosen subject. Unless you want a very obvious looking result, you will need a sharp knife to cut the print—preferably a scalpel or a good craft knife. If you can afford it, try to use a new blade for cutting each print.

Once you have cut out the subject, place it on the background print and move it around until it is in the right position. While you are handling the prints, take care to keep them free from greasy finger marks or these will prevent a good bond later.

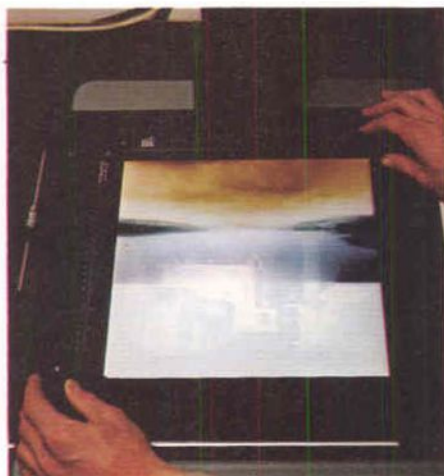
When you are satisfied with the positioning, place the tracing of the background over both prints and trace off the final position of the subject. The prints can then be prepared for pasting.

Apply a thin coating of suitable glue carefully to the back of the cut out subject and spread it out evenly, leaving a small gap around the very edge. Then, referring closely to the tracing, care-

Cut and paste montage



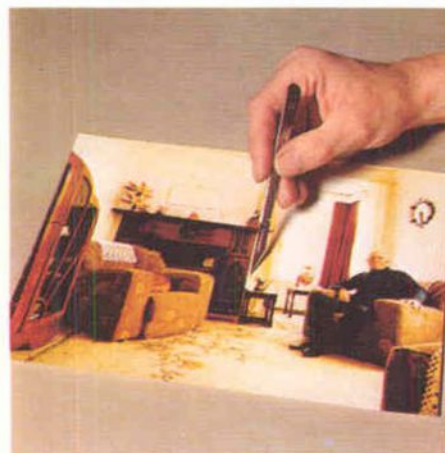
1 Select a suitable negative for the background and enlarge the image to your liking. Trace the image on white paper. This is later used for positioning



2 Print and process the background print and when it is dry place it on the easel. Line up and scale the second image by projecting it on the background print



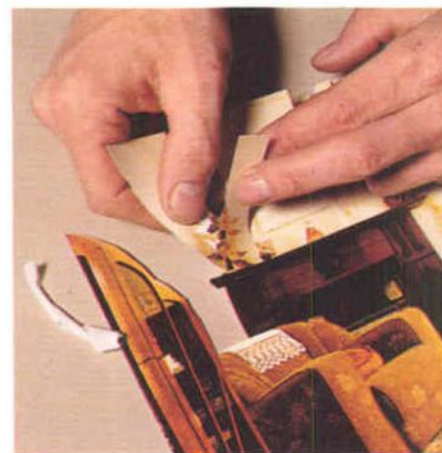
3 The two prints necessary for the montage are shown, together with a glue stick, scalpel and a sandpaper stick which is used for paring the emulsion



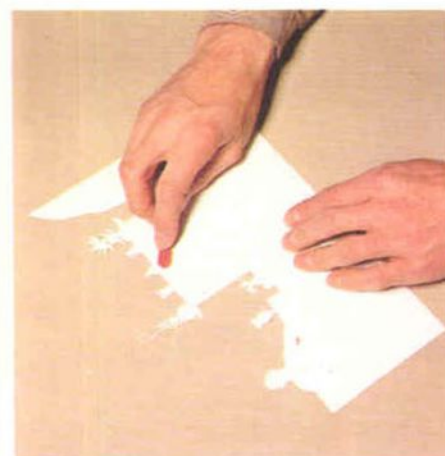
4 Lightly score the outline of the image to be removed. Make sure you cut only as deep as the emulsion layer. Use a new scalpel blade for each print



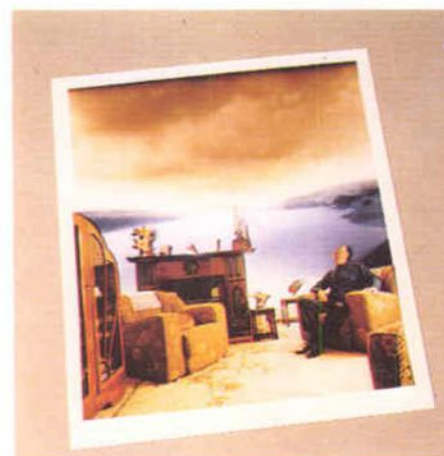
5 As excess paper is difficult to tear away without damaging the remaining areas, cut flaps. Concave areas are very difficult to remove otherwise



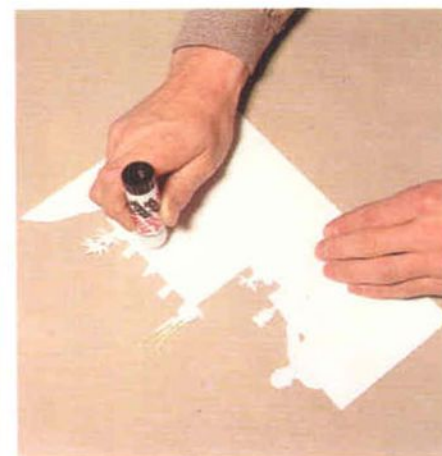
6 Very carefully tear away the excess areas of the print from the back of the remaining image. Firm, but not excessive pressure is needed for a neat job



7 Sandpaper the edges of the print on the reverse side to remove paper fibres and to make the print wafer thin. Work from the centre outwards



8 Check the position and effect of the cut out image on the background print. For stability, mount the background print before adding the cut out image



9 Spread adhesive evenly over the back of the cut out image, taking particular care not to spoil the front of the print, or tear the delicate cutouts

fully place the cut out subject on the background, dropping it only when the positioning is just right. To bond it firmly, cover it with a clean sheet of paper to avoid finger marks, and press from the middle outwards. When the cut out seems to have stuck, carefully lift the paper and remove any excess glue. Leave the montage to dry properly and then add further images, if you want, following the same procedure.

These rough cut montages can be attractive and are very simple to make, but they are very obviously composite images; the thickness of the paper shows up the joins very clearly. If you want to disguise these, you must refine your technique a little.

Invisible joins

For invisible join montages, you have to be much more careful in your choice of images. The perspective, lighting angles, densities and other characteristics of the subject must closely match those in the background—otherwise the joins will stand out clearly no matter how good your technique. It is not always easy to judge the suitability of the images before you make the montage and at first it must be a matter of trial and error.

Once you have chosen your pictures, make a background print and prints for the images to be overlaid in exactly the same way as for rough cut montages. The difference comes in the cutting. Instead of cutting right through the print, you aim to merely lift off the top layer of the paper. This thin top layer is much less obvious when pasted on to the background.

Using a new knife blade for each print, cut away altogether the unwanted parts of the subject print leaving about 3 cm to spare around the outline of the subject. Then lightly score the front of the print exactly along the outline, cutting only just through the emulsion. Hold the print to the light to check that you have scored all the way around. Make a series of cuts right through the print outwards at right angles to the outline so that you make a series of small flaps—be careful not to stray over the scored line into the subject.

Place the print face down on a clean surface and bend it up gently around the subject area to crack the emulsion. Then, very carefully, tear away the unwanted areas, by pulling on each flap in turn. As each flap is pulled back, it will tear the backing paper away beneath the subject leaving just a thin layer of paper attached to the emulsion.

The final cutout for the subject is thus very thin at the edges where most of the paper backing is removed and it should blend almost imperceptibly into the background print. You can make the edges even thinner by placing the print face down and rubbing, from the centre outwards, with the finest grade of sandpaper, but beware of sanding it so thin that it is almost transparent, or detail from the background print may show.

This technique should work for all types of printing papers, though you may have some difficulty removing the backing from resin coated paper. If you do have difficulty, try to lift a corner of the backing with a sharp blade and then pull the corner firmly but evenly.

Once you have one thin overlay ready, paste it down following the same procedure as for rough cut montages, taking particular care over each step. Disguise the joins further by coating the whole montage with a matt spray—this also evens out the textures and the spray includes an ultraviolet screen that prevents print colours fading.

Copying

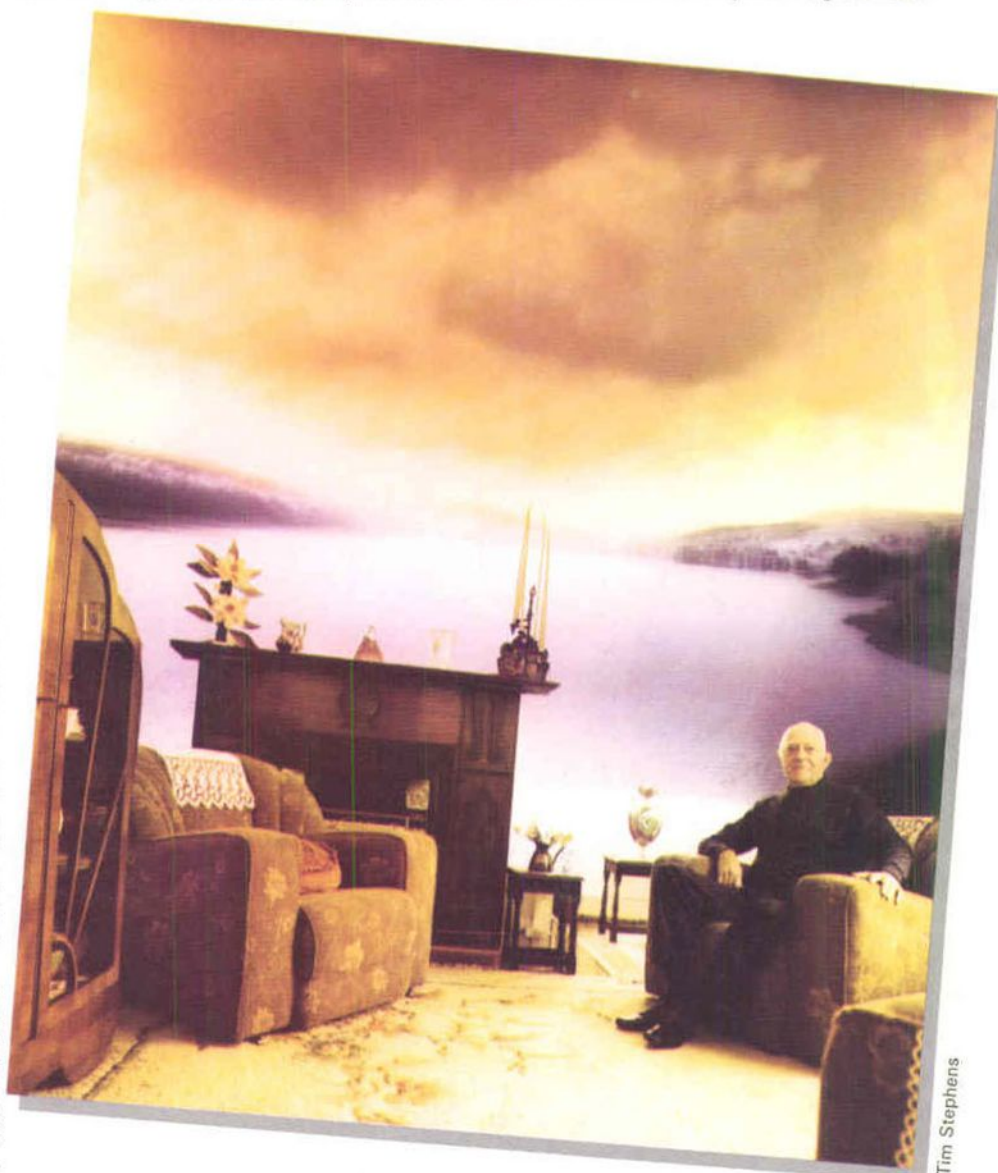
Unfortunately, invisible join montages may not last very long because the glue can affect the emulsion. So if you want a permanent image, it is worth making a copy by photographing the finished montage. The loss of quality inherent in copying is actually an advantage because it helps to disguise the joins even

better. When lighting the montage for copying, make sure that any raised surfaces do not catch the light or throw obvious shadows.

Montage without glue

If you intend to make copies, it is not always necessary to paste the montage together. You can simply lay the cutout on top of the background and keep the montage flat under a sheet of glass. The completed montage can then be photographed. Glueless montage is less messy and allows you to use the various prints again, but it can be very difficult to keep the cutouts in place as you lay down the glass.

Whether you use rough cut, invisible join or glueless techniques, montage can allow you to create a wide range of pictorial effects ranging from complicated multiple images to fantastic surreal portraits and landscapes. Just a few are shown here and further possibilities are explored in a subsequent article. But the best way is to experiment.



Tim Stephens

Completed montage After gluing, carefully position the cut out detail using the trace as a positioning guide, then place a heavy weight over the montage until dry



Improve your technique

Cameras abroad

Going on holiday with your camera outfit should present no problems if you follow a few simple guidelines on equipment and methods



If you are heading for somewhere that is always warm and sunny, for instance, you can take more slow film and less fast film—but it is worth taking some fast film in case you want to shoot with a long lens or late in the day. Similarly, a whole range of warming filters such as the 81 series will probably be wasted in a warm, sunny climate, but a polarizing filter may be invaluable for coping with glaring highlights and for giving richer colour saturation.

Any unnecessary equipment is a nuisance, not only to carry, but also to store safely, so if you can see that equipment will probably not be needed, leave it behind. And try to avoid taking two items where one will do. A single 80-200 mm zoom lens, for instance, is more convenient than a range of fixed focus medium telephotos. Any very long lens will inevitably need a tripod, but rather than taking a bulky full length model, take a handy table top tripod or a clamp with a tripod screw attachment.

It is, however, worth taking a second camera body to be loaded with an alternative film. You can, for instance, take one set of pictures on slide film for serious work and another set on print film for passing round among friends. Or you can load one camera with a slow film and the other with a fast film for use with a long telephoto, or for those romantic night time shots. More importantly, perhaps, the second camera body provides a second string to your bow should anything go wrong with your main camera. If you do not have a second camera body, try to borrow a compact 35 mm camera that will fit easily into a pocket and act as a reserve—though it is not usually a good idea to take untried equipment.

A small flashgun is also a surprisingly valuable asset, not only for taking pictures in low light but also for filling in shadows in strong sunlight—and you should take a spare set of batteries. While dry cell batteries are internationally available, others can be difficult to obtain or may be very expensive once you go to the more remote parts of the world. Take spare batteries as well for other electronic items such as light meters and electronic shutters.

To keep the equipment in good order, it is worth taking a few basic maintenance materials. A small brush or some lens tissues are ideal for keeping lenses sparkling. A set of jewellers' screwdrivers can be used to tighten up any screws that may work loose. A UV filter over every lens serves to protect the vulnerable lens surfaces.

If you are going to a very cold climate,

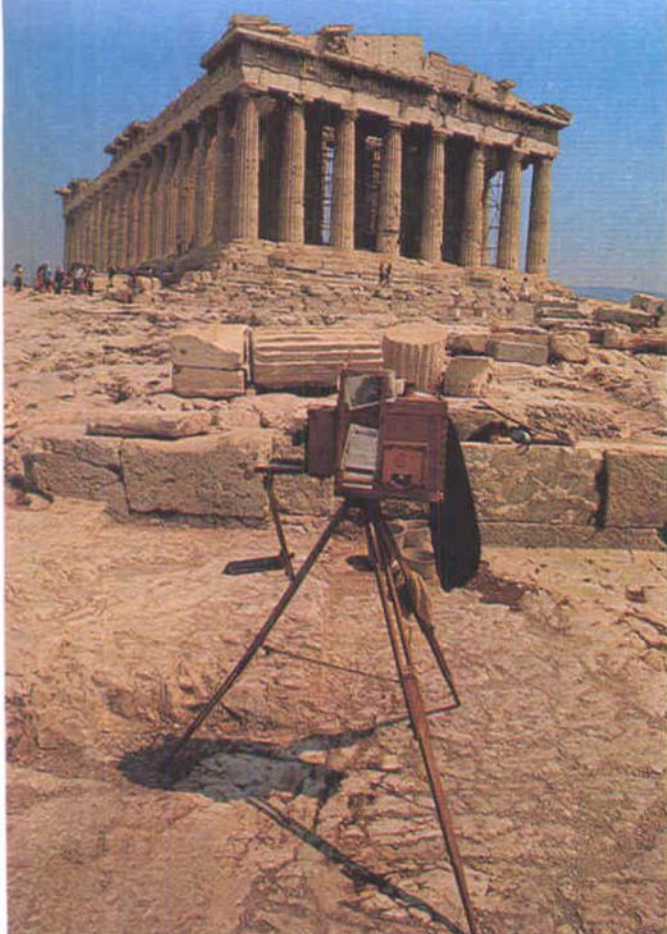
Victor Watts

A holiday abroad provides ideal opportunities for the photographer—new people, new scenery, new colours and, above all, more time to take pictures. But some hopeful photographers arrive at their destination only to find that they have wrong equipment for the conditions, or worse still, that valuable lenses or cameras have been damaged in transit. With just a little planning and forethought, however, you can avoid most of the pitfalls.

Choice of equipment is obviously vital. Some photographers try to cover

Loaded up How not to arrive on holiday abroad—take only the gear you anticipate using

every eventuality and go loaded down with every piece of equipment they can lay their hands on. Others go to the other extreme and take only the most basic camera and one type of film. Neither approach is ideal. You should aim to anticipate the type of shot you will be taking and the conditions in which you will be working. Take the minimum of equipment you need.



Times past Not long ago, taking photographs abroad meant carrying around equipment like this

View Points For a hike to the hills, carry your gear in a small, well padded haversack

it is possible to have your camera winterized by a camera repairman. This process involves removing all the lubricants from the camera mechanism, an expensive procedure that must be reversed as soon as you return to a warmer climate.

When all your equipment is assembled, make two copies of a list of all the serial numbers. Leave one at home, and carry the other with all your travel documents. A list of serial numbers can be useful when passing through customs, and if you are unfortunate enough to have any equipment stolen, you will need the numbers for both the police and for insurance claims.

Finally, when you know exactly what you are going to take, make sure that it is all fully insured against loss or damage. Even if all your equipment is already insured, check that you are covered for travel abroad.

When you are taking pictures, have a thought for people's feelings. That picturesque old man sitting under a tree may be a superb shot for you—to him you may be the 93rd tourist who has disturbed his siesta that day. But he may be a little less displeased if you can present him with a Polaroid print of the shot. It may allay any suspicions and show that you are willing to give something in return. But avoid giving people

money for posing. They will almost inevitably want more, and you may find that you are surrounded by a whole crowd of would-be models. Try to work openly but without making a fuss, unless you are prepared to be mobbed by small children.

Remember that native craftsmen are interested in selling, not posing, and if you wish to take good shots, be ready to make at least a token purchase before you try to take pictures.

Some people may have religious objections to photography, especially around shrines and other holy places. Respect their beliefs and put your

camera and equipment away.

The local tourist office can usually give you information about photogenic festivals and other events, and may also be able to tell you about local attitudes to photography in general.

In many countries, civilian airports may hold military installations and must not be photographed. Railway stations, harbours, government buildings and even bridges may also be sensitive subjects. Be careful when taking pictures of police or military personnel, even in industrialized countries. Many police forces are suspicious of photographers.

When choosing subjects, remember



In the market A moment's inattention when looking for shots like this could mean a stolen camera bag



that you are in a foreign country and taking only pictures of your family or companions with the country as a background is wasting a wonderful opportunity. Try to capture the atmosphere of the country. Do not just show the obvious differences in landscape and buildings; shoot the street signs, the people, the food, markets—anything that brings your attention. At the same time, do not forget the standard shots. A look at the postcards on display will give you clues as to the best viewpoints, and with some thought you may be able to improve on them.

If you use a car for storing things remember that heat will build-up and that your film stocks should be kept as cool as possible. Never leave your film cartons on view—as well as being a sure sign that there may be a camera around, the film may be degraded by the heat. If you intend to remain abroad for more than a couple of weeks and would prefer to have your film processed at home, keep your rolls of film in a refrigerator or a cool, dark cupboard until you leave.

Minor mishaps are inevitable, but the fascinating shots you can bring back should more than compensate. Providing you find out all about the country before you go, prepare your equipment carefully and keep your eyes wide open, your holiday snaps could be winners.

When you pack up your gear, try to fit it all in a single bag. When you reach your destination, it may be better to split it up, but when you are actually travelling, having all the equipment together makes life a good deal easier. This is particularly important if you are travelling by air.

Photographic equipment is safer carried as hand baggage on aircraft, since cargo holds are often cold and unpressurized. In addition, the vibrations of air-

On expedition *Typical of what can be packed, but do not try carrying it around all day—be selective*

craft in flight, which can easily loosen screws in cameras, are less severe in the passenger cabin. Airlines usually place a limit on the size of hand baggage, however, and you should check with the airline before travelling that your bag is small and light enough. Typically, the sum of the length, width and height of a bag should not be more than 114 cm. It is also worth finding out if your equipment bag will fit underneath the seat.

Whatever form of transport you take to your destination, though, it is worth paying particular attention to the way your equipment is packed. Gear that is left to roll around loose in baggage, no matter how tough and strong the packing case, will inevitably be damaged by the effects of knocks, shock and vibration. Lenses and camera bodies are particularly vulnerable so these should be carefully protected. Try filling your equipment bag with a large block of

foam with cut-outs for the individual items. If this cannot be arranged, at least wrap the more delicate pieces of gear in foam or soft material. The less room you leave for the equipment to move about, the safer it will be in transit.

If you have so much equipment that some of it must be carried in the hold, stow it in a metal case if possible, since this gives extra protection. This should be properly labelled and locked to prevent pilfering. Awkward items like tripods should have the legs secured together and all protruding knobs and screws removed. Make sure all locking knobs are tight to prevent them from vibrating loose when travelling. Other items that may shake loose or work free should be carefully taped together.

Another danger to be wary of when travelling by air is X-ray examination of baggage. Opinions about the effect of these examinations vary, but it seems that a single X-ray inspection produces a low dosage and has little effect on most films. It is only when a roll of film has been subjected to numerous doses of X-rays that it begins to show the effects. Lead lined foil bags do not give much protection.

Some X-ray machines have a high output which will reveal such details as the number of bullets in a gun. No film can be protected from such high intensity beams. It is possible that the baggage for the cargo bay may undergo such treatment, so the safest course is to carry all your film, both unexposed and exposed, with you. In many countries, you can ask for luggage to be inspected by hand, so the best solution may be to put all your film in a transparent plastic bag for easy inspection.

It is often useful to be able to identify your bag from a distance, so try to make it as recognizable as possible—perhaps plastering it liberally with brightly coloured decorations. Always put an address tag inside your bag, but never label in such a way as to identify its contents. Where your camera is concerned, be suspicious of strangers.



Claus C. Meyer/Colorific

Sand sports *Beware of sand when using your camera on the beach—it can lurk in crevices and scratch the film*

Travellers have been known to hand their bags to bogus porters and never see them again.

Starting to shoot

Do not overlook the fact that the journey to and from your destination involves new subjects and scenes of interest virtually from the moment you leave.

So it is worthwhile taking some scene setters: the trip to the airport or docks, on board the aeroplane or boat, booking into the hotel or campsite. For this,



Jeremy Gower

Extreme weather

Modern cameras are very robust and can cope with a surprising range of conditions, but they can fall prey to extremes of damp, dust, heat and cold. If you are going to countries with extremes of climate, therefore, you must take extra precautions to protect your equipment.

For a climate that is very wet, take plenty of touch-seal polythene bags and a supply of 'self-indicating silica gel'. Silica gel can be bought from your local chemist fairly cheaply and should prove invaluable. If you put silica gel in the polythene bags with the equipment, it absorbs all the moisture and keeps the equipment completely dry. The advantage of self-indicating gel is that it indicates when its capacity for absorbing moisture is exhausted by changing colour. Normally it is blue but as it absorbs more and more water it turns pink. When it is completely pink, you should remove it from the bag and dry it out in an oven. Only when it is dry and blue can it be used again.

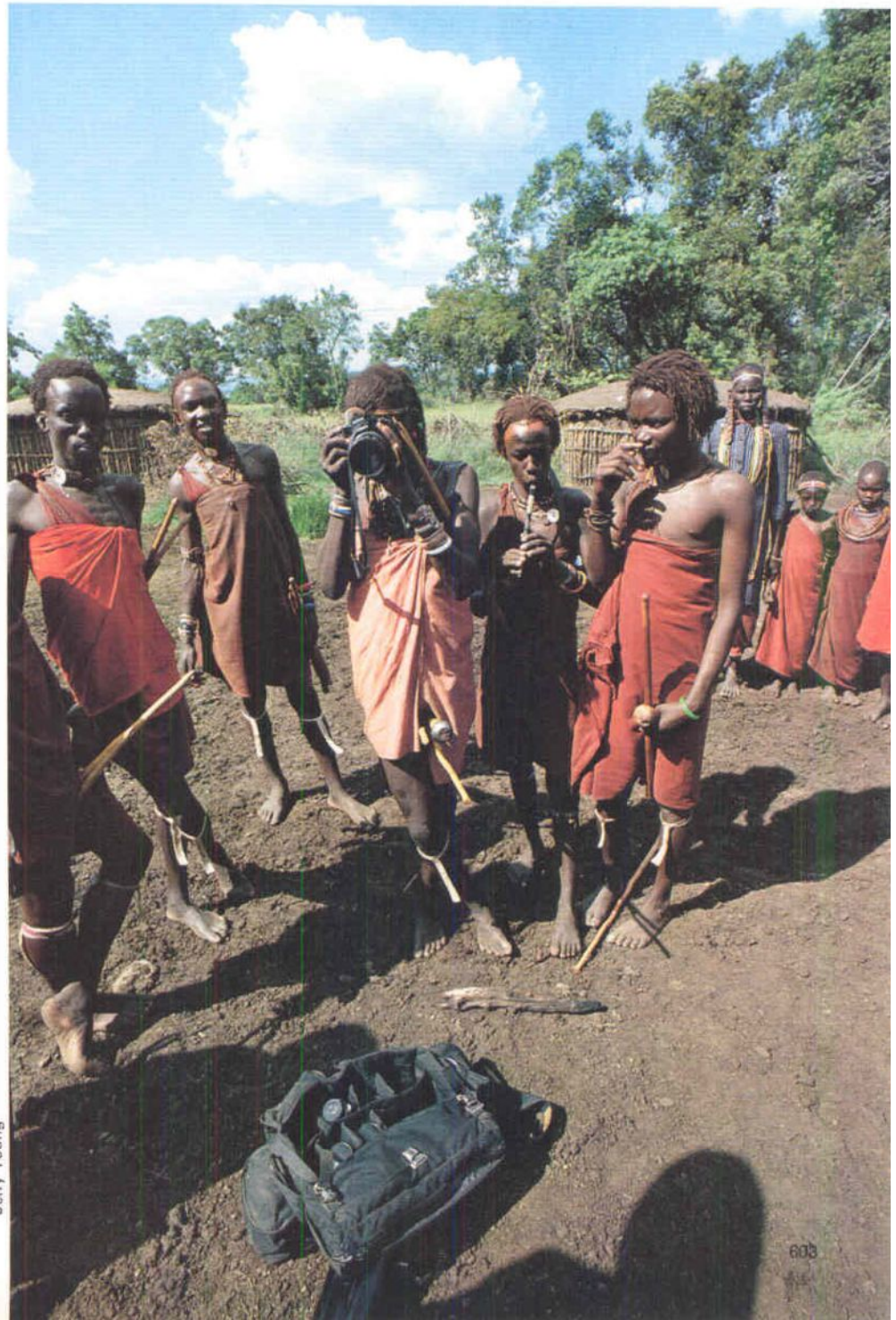
Plastic bags can also be invaluable in dry, dusty conditions but dust can wreak havoc with the delicate mechanisms and you should make every effort to keep dust out of your camera. Never leave the camera in an exposed place where the wind can drive dust into the cracks. And put all equipment back into cases as soon as you finish using it. When you return to your hotel in the evening, carefully but gently clean the camera with a blower brush.

With low temperatures the photographer's main thoughts may be about keeping warm and this is important, but spare a thought for the camera as well. Electronic parts such as the light meter may suffer as the cold impairs the efficiency of the batteries. Keep a spare set of batteries in a warm pocket and if the meter shows any signs of inaccuracy, put the warm batteries in the camera. You may be able to buy a separate battery holder which fits in your pocket, and is linked to your camera by a cable.

If you are visiting very cold areas you should have your camera winterized—all moving parts are degreased, and relubricated with a thinner grease which works better in the cold.

In hot climates, it is the film that suffers and you should take every precaution to keep it cool. Use only film that you know has been properly stored—film brought from home—and keep it in insulating expanded polystyrene boxes out of direct sunlight. If you can, put the film in a refrigerator overnight in tightly sealed polythene bags with a little silica gel. Although cameras are rarely affected by heat, never leave them standing in direct sunlight.

Jerry Young



however, you may have to unpack some of your equipment. Rather than do this, try to take a pocket-sized compact in addition to the rest of your gear and always keep it to hand.

When you arrive in another country, bear in mind that you are a guest in a place where customs and attitudes may be very different from your own. Be cautious, and be sensible. Never do anything that would cause offence in your own country and do not offend local sensibilities either.

Safe stowage Keep equipment with you. There is often room for bags beneath airplane and bus seats

Magic box In some places photography is a novelty, so explain what you are doing to interested parties



World of photography

Richard Cooke

Dramatic scenes of aircraft zooming across the sky or performing aerobatics are the hallmarks of Richard Cooke's photography. He enjoys the challenge of taking 'impossible' pictures in tough conditions



Many Royal Air Force recruitment advertisements show incredible close-up shots of jet fighters flying thousands of metres up in the clouds. You may think that these are clever photomontages or shot on special equipment with long focus lenses. But they are not; they are genuine and are taken with a normal SLR and wide angle lens from a plane by photographer Richard Cooke, with the jet fighter roaming barely one and a half metres away.

When Cooke started taking 'air-to-air' photographs in 1976, people had taken pictures of planes from other aircraft before, but he felt that none of these got quite close enough. With skilful flying, he could get a little nearer, but while the photographer was confined within the cabin, this was still not close enough. So to take his most dramatic pictures, he wanted to attach his camera to the outside of the plane.

Red Arrows This group of Hawk jet fighters was photographed by Cooke's camera strapped underneath the leading plane (out of the picture). A shutter speed of 1/30 second helped create a feeling of speed



Strapping a camera to the outside of a jet plane is much harder than it seems, as he soon discovered. With air moving over the plane at over 1000 km/h, it not only has to be very firmly mounted, but also protected by a specially built aerodynamic housing. Fortunately Cooke had developed a close association with Squadron Leader Alan Voyle, senior engineer with the Royal Air Force's Red Arrows aerobatic team. Voyle was able to develop a special housing kit that completely protected the camera.

A less easy problem to overcome was that of the extreme cold at high speeds and high altitudes.

The manufacturers of the Nikkormat EL they wanted to use said that the camera would not work properly below freezing point. As Cooke has discovered, it is capable of working at much lower temperatures, but he did encounter problems at first.

'The first time I flew an external camera at high altitude was on a Phantom at about 35,000 feet. The air temperature outside was about -50°C . When the film came back there were strange dark bars across the pictures—two dark bars horizontally and one diagonal. I thought it was odd because I recognized the pattern—it was the same pattern as the design of the shutter. Alan Voyle suggested that the wind was getting in around the lens! It was blowing through the inside of the camera between the leaves of the shutter, and freezing the

Ice wall Conditions like these give Cooke the kind of challenge he enjoys. He had to take precautions against the dangers of frostbite and his very thick, cumbersome gloves made picture taking extremely difficult

Ready for take off When Cooke goes up in a plane, like this two-seater Gnat jet fighter, he has to wear the same safety gear as the pilot. His dark gloves help stop reflections on the shiny surface of the plane's canopy

film as it passed through the back.

The wind was so cold that, where it blew on the film, the film was simply not working. The answer was surprisingly simple—putting a piece of sticky tape around the lens—'There's often a low technology answer for a high technology problem.'

Cooke and Voyle's camera housing kit has to be fixed to the aircraft before take-off and the pictures have to be constructed beforehand in Cooke's mind. Decisions about which lens to use also have to be taken in advance. Cooke enjoys the kind of dramatic images you can get with wide angle lenses. For his head-on shots of a plane coming up from behind, Cooke normally uses a 20 or 24 mm lens. One of Cooke's ideals is to bring to photography the kind of excitement and bold graphic images that are found in the best comic book art.



Richard Cooke

An air-to-air photographer is naturally more at the mercy of the weather than most photographers. Apart from rain and cloud cover, there are also the problems of turbulence and the incredible forces encountered when an aircraft accelerates, decelerates or changes direction. These forces demand special clothing that helps stop the blood rushing from the brain and causing a blackout.

Another piece of clothing that is important if Cooke is taking pictures through the plane's canopy is a pair of dark green gloves. If Cooke were to shoot with his bare hands, his fingers would be reflected by the transparent canopy and appear as 'large, pink bananas' on the pictures.

Once the camera housing is attached to the aircraft beneath the fuselage and Cooke is properly attired, work can begin. He communicates with the pilot of the aircraft he wishes to photograph by

radio. They discuss before take-off what sort of picture Cooke is looking for. There is a sighting system, details of which Cooke has never divulged. It is this that enables the pilot to know when he is in exactly the right position. The pilot tells Cooke when he is about three metres behind Cooke's plane. Although he cannot see what his camera sees, Cooke then 'composes' the picture, taking into consideration the background and the light.

'I might be going down into a valley, for example. If it looks good I ask my pilot to fly on for, say, 10 kilometres, do a 180° turn and come back. I know that what I've seen ahead will now be the background.'

Harriers above Wales (overleaf)
Cooke's wide angle lens can capture breathtaking landscapes as well as dramatic shots of planes







Richard Cooke



Tornado F2 Cooke plans a picture like this before he goes up. A successful shot depends upon very accurate communication between Cooke and the pilot behind. The distance between Cooke's plane and the Tornado was only 3 metres

The Sharks display team These Royal Navy Gazelles were training for an air display. Cooke's camera was fixed to the outside of another helicopter, and was remotely fired when he judged the view and composition to be just right

Rather than actually seeing the picture in the viewfinder, Cooke works out what the camera can see and composes in his mind.

'If you're in control of all the elements in the picture, you're in control of the picture—even if you don't see it.'

Cooke believes that air-to-air photography can be compared in some respects with 'Zen archery'—the alleged ability of some Zen monks to hit a bull's-eye blindfold. He has to follow the picture through in his mind and then choose the exact moment. He feels that motor-drives do not give sufficiently precise timing, as human reactions are about 10 times faster than the fastest motordrive picture interval.

Cooke operates the camera using the aircraft's 28 volt supply. This normally operates either an adapted weapon control system or a lighting circuit, depending on the plane. With a motordrive in continuous operation, Cooke would probably miss the shots he wanted as the camera is busy winding on at the split second he wants to take a picture. But the camera does have an autowinder to wind on the film between each shot.

Cooke knows he is lucky in being suited to air photography. Many people would be sick flying at such altitudes

with the plane diving and looping through the sky. The aircraft seats were, after all, designed for pilots to sit back in them properly. If you are taking pictures, you will be leaning over, twisting your body round and peering out of the canopy. Cooke also knows he is fortunate in being able to work with a group of superbly professional pilots, whose skill and judgement he is the first to praise.

His association with Alan Voyle has been particularly valuable. Voyle has now left the RAF and works with Cooke on a number of technical developments connected with photography. A typical joint project is their plan to develop a 'camera' that can fly silently at low levels and take pictures it would be impossible to get even with a helicopter.

One example of Voyle's engineering was the device he developed, similar in principle to the aircraft kit, that made it possible for Cooke to get some amazing pictures of world water-skiing champion Mike Hazelwood. Hazelwood was travelling at 80 km/h and the camera, fitted with a 16 mm lens, was only one metre away, attached to the tow rope. As Cooke points out, this kind of picture had never been taken before. If you were in a fixed position the skier would hit you. The lightweight Nikon had been

specially sealed against water spray and Cooke sat in the back of the boat watching Hazelwood. Like the air-to-air pictures, Cooke could not see what his camera saw. He had to keep one eye on the camera. Only when the camera appeared steady could Cooke operate the shutter.

Cooke seems to enjoy a challenge and he has been on several expeditions to the Arctic, which, like his air-to-air photography, would have been impossible without a fully trained professional team. He has carried out commissions for a number of magazines when accompanying the 45 Commandos of the British Marines.

Frostburn from the cameras (the same feeling as a burn from dry ice) presents just as much of a problem as frostbite in the extremely low temperatures of the Arctic. Cooke covers each bit that he touches with layers of black sticky tape, so that his fingers are not in contact with metal. As he says, you cannot operate with thick woolly gloves.

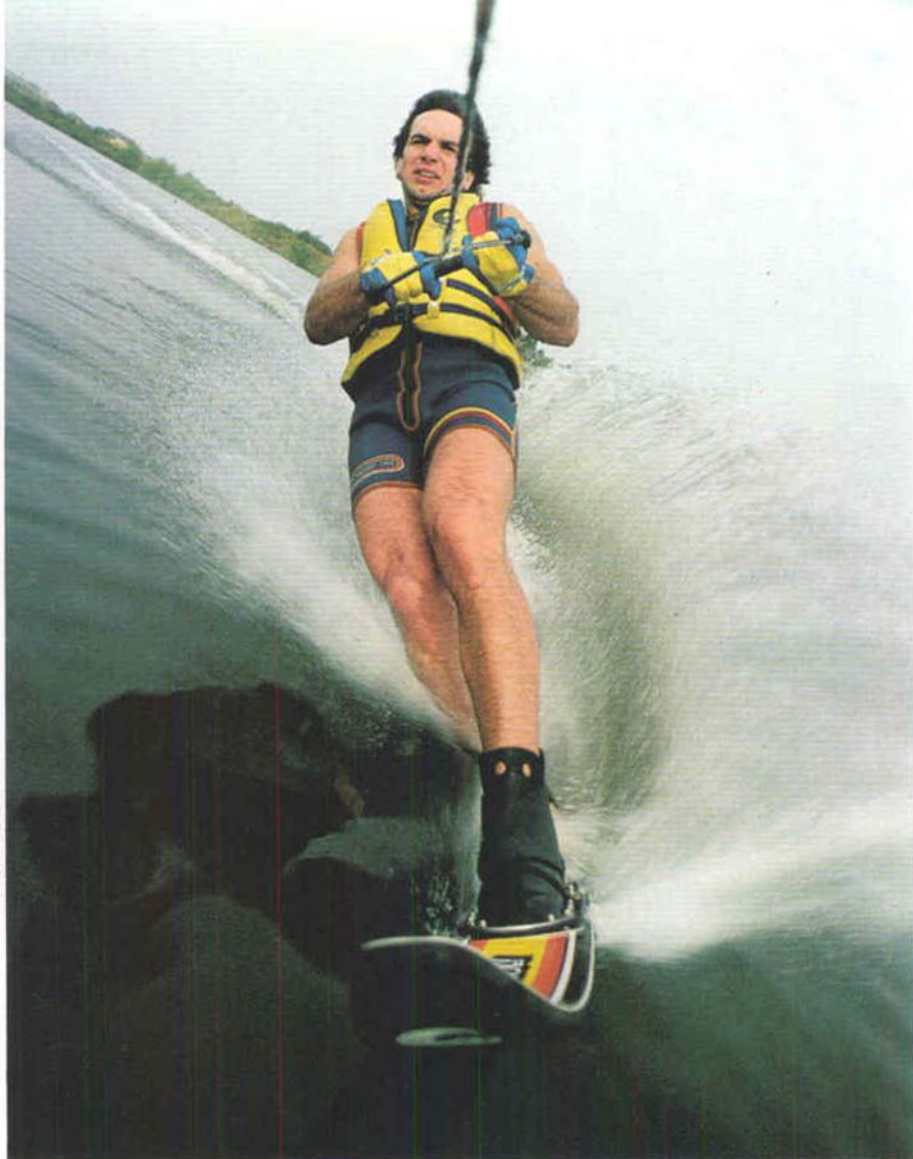
Cooke enjoys the technical as well as the human challenges of his photography. The dramatic pictures that result from this enjoyment have helped to broaden the frontiers of the art.



Richard Cooke

Water skier With his camera attached to the tow rope, Cooke took this picture of world champion water skier Mike Hazelwood at about 80 km/h

Arctic conditions Cooke and the Commandos were dropped by helicopter 800 km inside the Arctic Circle where the temperature was -25°C



Richard Cooke



Rangefinders

Rangefinder cameras make sharp, accurate focusing very easy to achieve by employing a simple geometric principle. But exactly how do they work?

image of any object in the centre of the screen. One of the two images is often slightly coloured. Only by focusing the camera can the two images be united to form a single one, because turning the focusing ring moves the pivoting prism, and this in turn moves the secondary image in the viewfinder.

Rangefinder accuracy

The distance between the two windows of a rangefinder is known as the *base length*. The longer the base length, the more accurate the rangefinder is likely to be. Specialized rangefinders like those used for military purposes have a base length of a metre or so, but on cameras the base length is much shorter. The Leica, for instance, has a base length of about 48 mm, and on some compacts the base length is as short as 18 mm.

Interchangeable lenses

Adapting a rangefinder to work with various lenses can be very complicated, but a number of rangefinder cameras will accept interchangeable lenses. Such lenses are fitted with a special coupling mechanism. This consists of a cam at the rear end of the lens which abuts a small roller at the end of the arm. This arm moves the rotating prism of the rangefinder. As the focusing ring is turned, the cam moves the arm in and out to rotate the prism.

There is a limit to the focal length of lenses with which a rangefinder will work, and this is set by the base length of the rangefinder. Cameras with a long base length, such as the Leica, can be used with lenses as long as 135 mm—the accuracy of focusing increases with shorter focal length lenses. The short base lengths on compact cameras are usually sufficiently accurate to focus the short length lenses with which they are fitted.

Since the photographer does not look through the lens of the camera but through a separate window, most rangefinder cameras have bright white lines in the viewfinder to indicate the frame. Some cameras that can accept interchangeable lenses have a device that shows a different brightline frame for each lens that is used. When a long focal



Michael Newton

For pin sharp pictures you must focus perfectly on the subject. With SLRs, focusing is visual and you simply adjust the lens until the subject appears sharp in the viewfinder. With other cameras you estimate the distance of the subject and rely on good depth of field to cover any errors. But there are some cameras that show you when perfect focus has been achieved.

These cameras, known as *rangefinder* cameras, actually measure the distance from the camera to the subject with an optical device linked to the lens.

Triangulation

Rangefinders work on the same principle that surveyors use to measure distance, the principle of *triangulation*. Triangulation is a simple geometric technique based on the premise that if you know the length of one side of a triangle—the *base line*—and two angles, then you can work out the length of the

other two sides. So, by looking at a distant object from two points of known distance apart, you can calculate how far away the object is. This is done by measuring the angle between the base-line—that is, the line between the two observation points—and the distant object, from each of the two observation points.

When we use our eyes to judge distance, we are unconsciously making use of triangulation. We are familiar with the distance between our eyes, and this makes up one side of the triangle. We use the muscles around our eyes to make them converge on the object we are looking at. When they have completely converged, we see one image instead of two—the angle of each eye then gives an idea of how far away the object is. This process is completely automatic, but it enables us to make rapid, subjective judgements of distance—think how quickly you can do this when driving.

Compact or classic? Both cameras use rangefinders for focusing. The little Olympus uses a base length of about half that of the rugged Leica shown alongside it

Camera rangefinders

The rangefinder on a camera uses two different viewpoints, just like our eyes. These take the form of two windows on the front of the camera, each of which sees a slightly different view of the subject. One window sees the subject directly, but is fixed behind a semi-transparent mirror set at 45°. The mirror not only allows the first window to see the subject directly, but also reflects an identical image of the subject to the second window. Behind the second, smaller rangefinder window is a swinging mirror or prism which is coupled to the movement of the lens.

Though this seems rather complicated, the effect it has is simple—when you look through the viewfinder of the camera, you see a double



Homer Sykes

length lens is fitted, the lines in the viewfinder mark out a smaller frame in the middle of the viewfinder. With wide angle lenses, a bigger area is shown.

Parallax error

Because the view of the subject that you see in the viewfinder is slightly different to that of the lens, rangefinder cameras, like all non-reflex cameras, can suffer from parallax error (see page 390) particularly when focusing on nearby subjects. To counteract this,

Double image The centre of the viewfinder shows a double image of out-of-focus parts of the subject. Correct focus involves bringing the images together to form a single one

the bright-line frames in the viewfinder move down and across the viewfinder as the camera is focused on closer subjects. This is called *automatic parallax compensation*, and brings the framing in the viewfinder into line with the framing on the film.

Rangefinder or SLR?

At first glance, it may seem that focusing a camera by rangefinder, rather than by

eye, is unnecessarily complex but it does have a number of advantages.

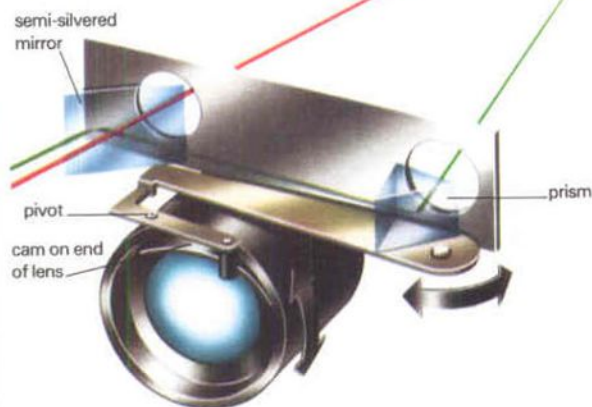
The most important of these is that the point of sharp focus is very easy to detect. SLR cameras are often difficult to focus, particularly in bad light or with wide angle lenses. Indeed, with a lens as wide as 21 mm, an SLR may be no more accurate when focused by eye than if the photographer guessed the

distance and set it on the lens. Rangefinder cameras are actually more accurate when used with shorter lenses.

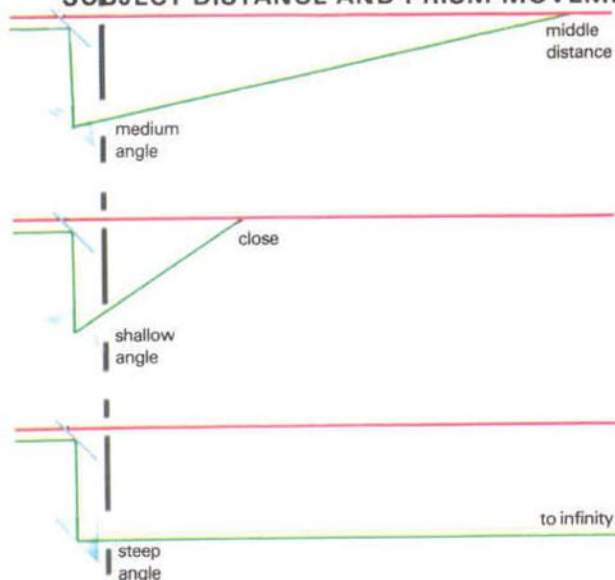
Because single lens reflex cameras have a mirror system to direct light up to the viewfinder, they are noisy and bulky, and the image disappears at the moment of exposure. Rangefinder cameras can be made smaller, and are quieter in operation. The loud 'snap' sound of the mirror rising is eliminated and there is less delay between shutter release and exposure.

How the rangefinder works

Twin windows on a rangefinder form a double image in the viewfinder. When the lens is turned to focus, a prism is turned, and lines of sight from the two windows converge



SUBJECT DISTANCE AND PRISM MOVEMENT



Venner Artists



Roll film cameras

Roll film cameras produce big images—four times the size of 35 mm film. This means that less enlargement is necessary when printing, and quality is much higher

With modern lenses and film, the quality possible with 35 mm film is good enough for most amateur photographers, yet many professionals still prefer to use a roll film camera whenever possible. Small enough to be hand held, roll film cameras take larger negatives that can give large high quality prints. Different cameras take different sized pictures, but even the smallest roll film negative is nearly three times the size of a 35 mm negative—the largest is over four times the size.

Roll film cameras are all larger than 35 mm. The extra size and weight makes roll film cameras slower to operate, and they lend themselves best to deliberate, considered styles of photography.

If you have been used to using a smaller camera, it may come as a shock to pick up a roll film camera. It might seem very bulky and awkward to use. If there is not a prism fitted, the image on the focusing screen is reversed, and panning the camera to the left makes the image move to the right. One or two roll film cameras do not have an instant

return mirror, and when you press the shutter release the viewfinder blacks out until the winding crank is turned to advance the film. This can be very disconcerting if you are not used to it. On the other hand, the big focusing screen makes viewing very easy and quick, and helps in composing the picture.

Film formats

You might hear some roll film cameras referred to as 'six-by-six' or 'two-and-a-quarter-square' cameras — this is simply the size of negatives they produce, which are six centimetres (or two and a quarter inches) square. The 6 × 6 cm format is certainly the most common, but there are a number of others.

Some models take a picture that measures 6 × 7 cm, and a few take pictures that are 6 × 4.5 cm. The larger the picture, the fewer frames you can fit on a roll of standard (120) film; with a 6 × 4.5 format you can take 15 frames, with a 6 × 6 format 12 frames, and with the largest size, 6 × 7, only ten frames. Certain types of film are available in a

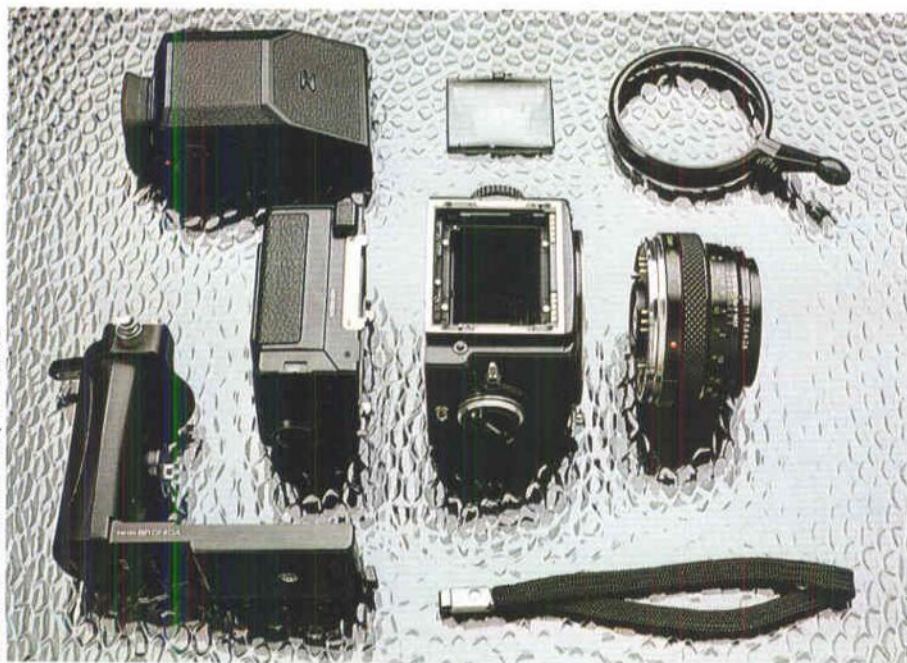


Modular construction In order to provide maximum flexibility, roll film SLR cameras can be stripped down to their component parts. Here, the lens, body, film magazine, focusing screen and finder have been separated

double length roll—220 film—and this gives twice as many frames, but the choice of film speeds with these long films is very limited.

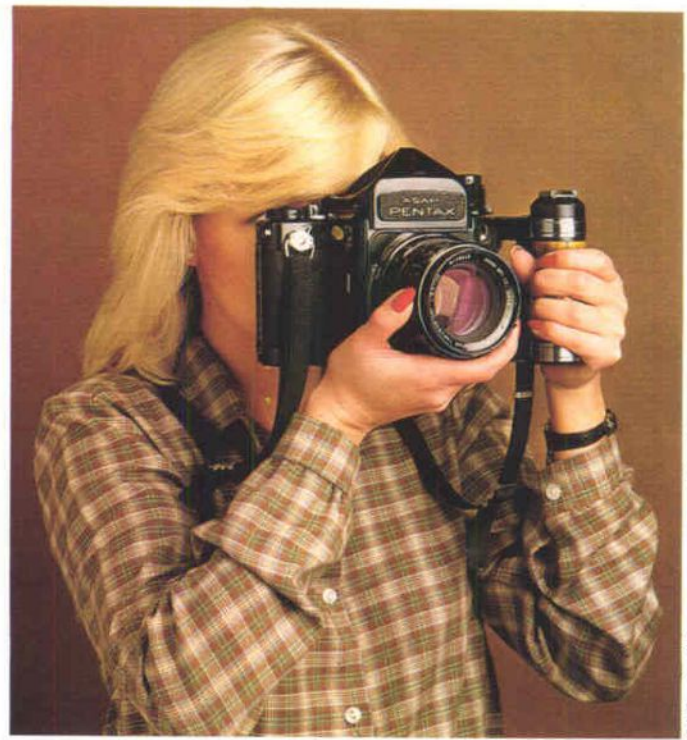
Since 6 × 6 cameras produce a square negative, they never have to be turned on one side. Vertical pictures are produced by cropping the sides, and horizontals, by cropping at top and bottom. 6 × 4.5 cameras normally produce a horizontal picture, and must be turned through 90° for a vertical composition. Consequently, they have to be used with a prism viewfinder. The same is true of the Pentax 6 × 7, but the other 6 × 7 SLR, made by Mamiya, has a revolving back which makes a prism unnecessary.

Much is made of differences in film





Ed Baxter/Camera courtesy of Bronica



Ed Baxter/Camera courtesy of Bronica

Boxy bodies

The general shape of roll film cameras is much more square than 35 mm cameras, but the Pentax 6 × 7 looks very much like an overgrown 35 mm SLR. This means that it can be used in very much the same way as the smaller cameras that it resembles

cameras accept many different types of magazines. Hassleblad cameras, for example, can be fitted with magazines that take 120 and 220 film, Polaroid film, sheets of cut film, and long rolls of perforated 70 mm film allowing as many as 100 exposures without changing magazines. On 120 film alone, three different formats of negative are available—6 cm square, 4 cm square, and 6 × 4.5 cm.

Not all roll film cameras can take interchangeable backs. An interchangeable back adds considerably to the cost of a camera, and some cameras are available in two models, one with, and one without interchangeable backs.

Certain cameras have a motor drive which can be attached as an accessory, but a couple of cameras have the motor built in. Whichever approach is adopted, motor drives for roll film cameras seem pedestrian compared to autowinders for 35 mm cameras. A framing rate of one picture per second is quite a respectable speed for a motor driven roll film camera. The thin, sprocketed ribbon of 35 mm film can be driven through a camera at a speed that would quickly snap the broad strip of roll film.

Lenses and shutters

The standard lens on a roll film camera usually has a longer focal length than that of a 35 mm camera, but its angle of view is about the same (see page 307). 6 × 4.5 and 6 × 6 cameras are usually fitted with a 75 or 80 mm lens as standard, and 6 × 7 with a 100 or 105 mm.

The maximum aperture of these lenses is usually two stops smaller than a 35 mm camera lens, typically *f*/2.8 or even *f*/3.5. This is not really a handicap in practice because roll film cameras do not lend themselves to shooting pictures in low light conditions, and at any given

area between 6 × 7, 6 × 6 and 6 × 4.5, but in reality, the useful area of each is fairly similar. The difference between 6 × 6 and 6 × 4.5 is largely that the square format can be cropped after exposure to a vertical or a horizontal. This choice is not available if you opt for the smaller format. 6 × 4.5 cameras are generally cheaper, though, and give you an extra three frames per roll of film.

The modular approach

The camera body of a roll film camera can be thought of as a basic shell on which to build. This is literally true in the case of a few models, where the body contains only the reflex mirror and a simple shutter. The other components—lens, film magazine, focusing screen and viewfinder—bolt onto this simple box.

This approach produces cameras which look very different from their 35 mm counterparts. They look very box-like, and this impression is reinforced by the folding direct vision focusing hood that is often supplied with the camera in

its standard form. This hood can be replaced with a variety of prism viewfinders, like those on 35 mm SLRs, which make viewing much easier. Some cameras can be fitted with prisms that have a built in through-the-lens (TTL) meter, and this can sometimes be linked to the aperture and shutter speed to provide fully automatic exposure control. Normally, though, photographers use a separate hand held meter with roll film cameras, unless TTL metering is vital.

Magazines

Unlike 35 mm cameras, many roll film cameras accept interchangeable film magazines—backs that simply clip on and off the back, allowing you to change the film in an instant. With these magazines, you can change from colour film to black and white in a matter of seconds even in mid roll. Or you can make quick test shots—testing equipment and lighting—with Polaroid film and switch to your chosen film for the real session.

The most comprehensively equipped

Electronic automation The Zenza Bronica uses an electronically controlled shutter and iris diaphragm. Six contacts link the camera body to the lens

aperture, the depth of field available is less than it would be on a smaller format camera. This means that roll film camera lenses are rarely used at full aperture, except for focusing.

Like the bodies, roll film camera lenses are larger and more expensive than their 35 mm equivalents, and there are fewer different focal lengths available. Unfortunately, each camera takes only lenses made by the camera manufacturer. It is not possible to buy cheap lenses from an independent company.

For a 6 × 6 camera, a typical wide angle lens is one with a focal length of 50 mm. Although direct comparisons are difficult because of the different negative shape, a 50 mm roll film camera lens gives an angle of view that corresponds to a lens for a 35 mm camera with its focal length of between 28 mm and 35 mm. A typical portrait lens for 6 × 6 camera is 150 mm—this roughly corresponds to an 85 mm lens for a 35 mm camera.

For roll film cameras that use leaf shutters (see page 110), the shutter is inside the lens. So each lens for these cameras has to have a shutter and can be very expensive. Other roll film cameras have focal plane shutters similar to those in most 35 mm cameras. Focal plane



shutters are in the camera body so the lenses are usually considerably cheaper.

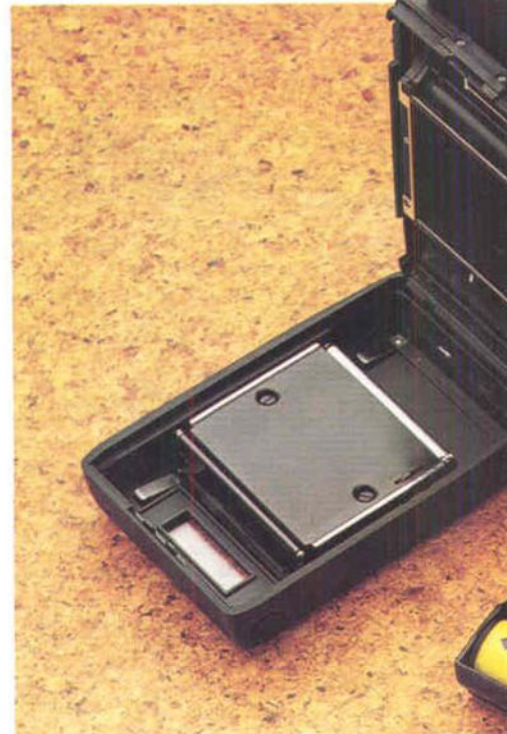
There are advantages to both shutter types. Focal plane shutter cameras can be developed into a 'system' more cheaply, but flash synchronisation is only possible with a small number of shutter speeds. With leaf shutters, flash can be synchronized with all speeds. For many types of photography this is a considerable advantage. For instance, freezing action with flash or using flash

as a fill-in with daylight often needs a fast shutter speed. This is only possible with a leaf shutter. Several roll film systems with focal plane shutters in the camera body have one or two lenses with leaf shutters for just this reason. The Hasselblad 2000FC, for example, has an integral focal plane shutter for use with the light F series lenses but will also take the leaf-shuttered C series lenses of the other Hasselblads.

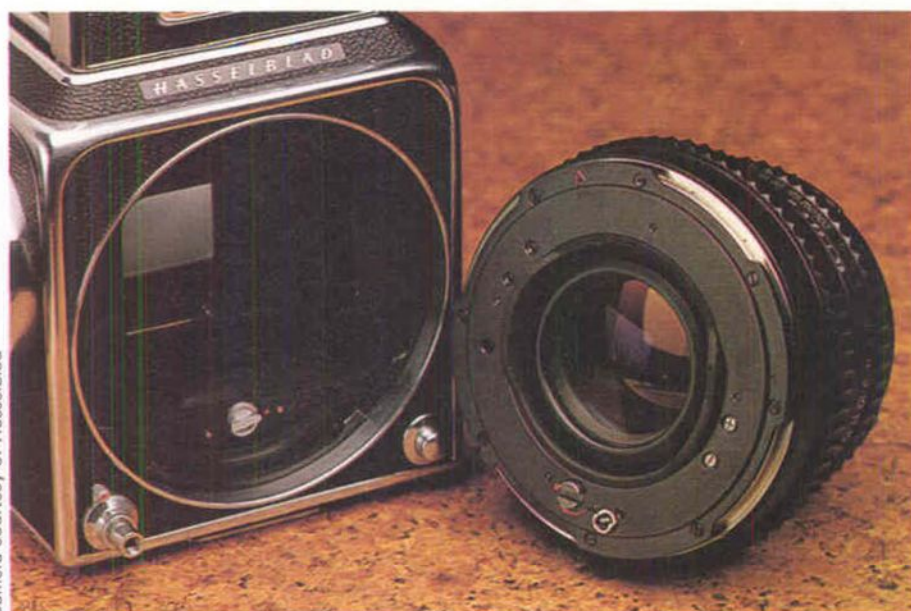
Whether leaf or focal plane, however,



Polaroid Back The great advantage of owning a camera with interchangeable backs is that you can switch film in mid roll. Here the photographer has changed from roll film to Polaroid to make a lighting test



Camera courtesy of Hasselblad



the range of shutter speeds on a roll film camera is not usually as extensive as on a 35 mm camera because the shutter is bigger and heavier to open. A range from 1 second to 1/500 of a second is normal, with only a very few cameras offering 1/1000, and only one, the Hasselblad 2000FC, offering a speed of 1/2000. In general, cameras with leaf shutters have slightly slower top speeds than those fitted with focal plane shutters.

Film packs

When a camera has a fixed back, film can often be preloaded to save time when changing rolls



Ed Baxter Camera courtesy of Rollei

Mechanical control The leaf shutter on the Hasselblad 500CM is purely mechanical, and a slotted rod cocks the shutter. The adjacent pin releases it

Choosing and buying

Even the most basic roll film camera gives considerably better quality than most 35 mm cameras, and if you can find a secondhand TLR, it is well worth the effort. Features, such as interchangeable magazines and lenses are expensive, and a new roll film camera is a major investment.

It is, therefore, a good idea to be sure you have the right camera before laying out any money. If you live in a large city, it is usually possible to hire roll film equipment for a day or two to see how it handles. If this is not possible, a camera club, or a local adult education class may give you access to a roll film system.

Film format and price are perhaps the most important considerations but there are many other factors that can affect your choice of roll film camera. Some systems have lenses and accessories that are not available to fit competing cameras—Bronica, for example, have a unique perspective control lens that allows the photographer more versatility when dealing with architectural subjects. The Pentax 6 × 7 is particularly easy to use, and the Hasselblad system has by far the widest range of lenses and accessories. Any of these factors might influence your decision. In terms of quality, you cannot lose, and a print from a roll film camera, however much it costs, will be superior to one made from a smaller format.

Roll film formats Any format gives a good deal more picture area than 35 mm. These examples show the exact size and proportions of the three common formats. 35 mm is shown at the top for comparison. Below it are 6 × 4.5, 6 × 6, and 6 × 7 cm



Rozencwajg/Atlas Photo

35 mm



John Watney

6 × 4.5



Barrie Smith/Photographers Library

2 1/4 sq



Andy Williams/Robert Harding Associates

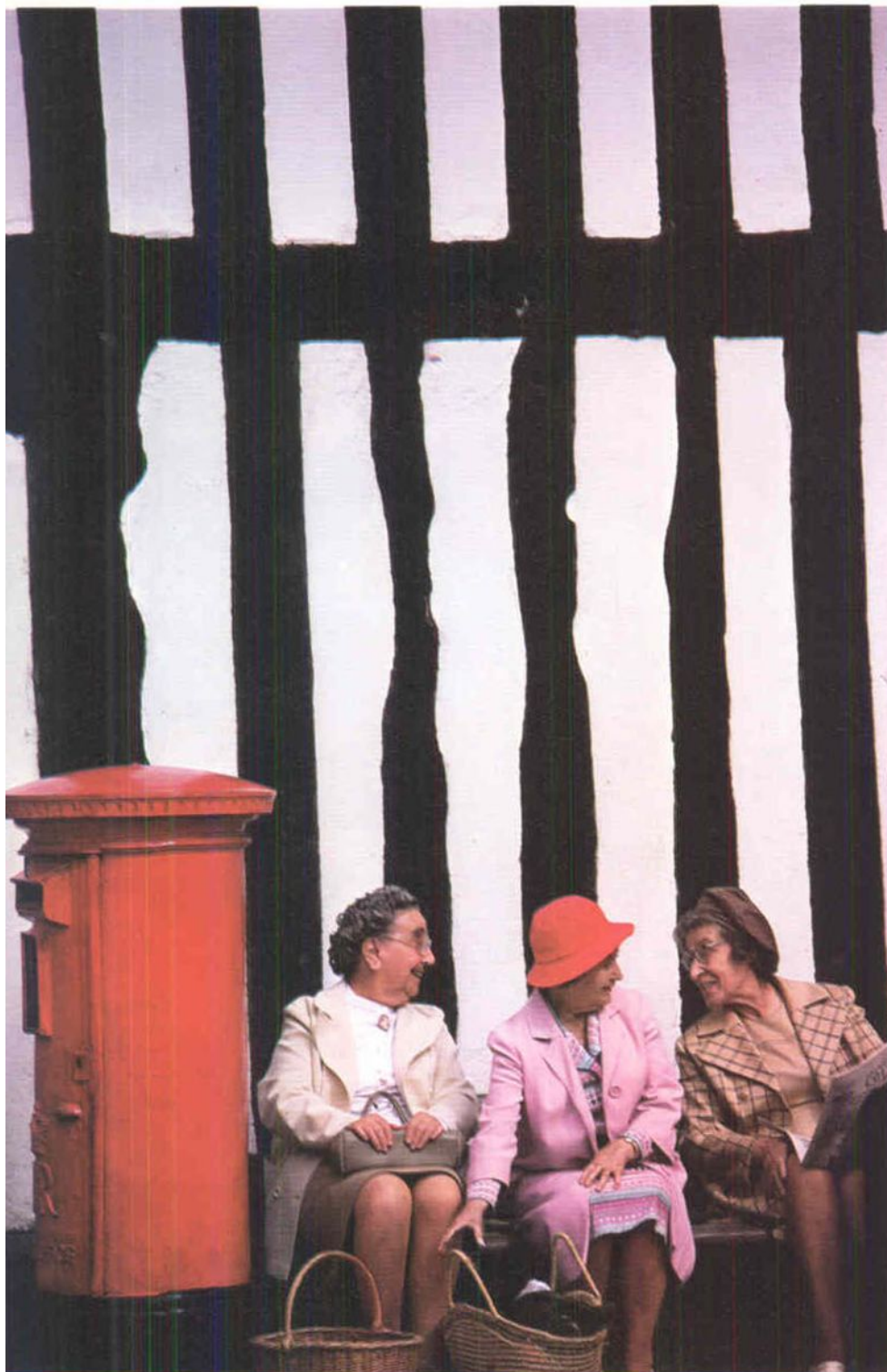
6 × 7



Creative approach

Old people

Whether you are taking a formal portrait or a candid shot, you will often find that elderly people make interesting and rewarding subjects. But the best results will be gained from the right approach



Photographing old people demands far more attention and consideration than many other types of work. While everyone has at some time snapped a candid shot of some elderly character, just as they might photograph any other interesting subject they happened to come across, anything more premeditated can call upon all a photographer's skills, both technical and social.

Why should anyone want to photograph an old person? One reason might be that the person is a relative or friend who just happens to be elderly. But if the reason is that the old are photogenic, perhaps implying easy subjects who are unlikely to object to the invasion of their privacy, then be careful. It is all too easy to take pictures which are stereotyped and predictable, and which may even unintentionally insult the individual. It would be a simple matter to concentrate on the negative aspects of old age, and to miss the subtler insights into your subject's personality.

Many photographers feel that there is something intrinsically interesting about old people. The very fact of having 'made it' to some advanced age seems worth recording by the camera. This may be true, and in many cases could lead to a telling and interesting picture. But it is important to try to avoid the superficial, the easy and unkind photograph. The texture of the skin on an old person's face can result in an unusual picture, but we all know that the old look old, and in close-up older still.

If you think about the old people you know well, perhaps in your immediate family, you will realize that they have the same range of characteristics as younger people. Some are energetic, others aren't. Some are optimistic and humorous, others not. Some are gregarious, and so on. So be aware of the individual personality of your subject, and avoid the usual cliché which we so often associate with pictures of the old, namely the isolation of age.

Many people who reach advanced years have lost their partner in life. If this is the case with your chosen subject, consider including mementos of the past in your photograph. We accumulate so much ephemera in our passage through life that a picture which includes a favourite piece of furniture, or possession, can both create a visually interesting background and help to relax your subject. Such an approach allows you to make an implicit comment on loneliness, while at the same time placing the person firmly in a real and living world.

You may be asked to take a formal portrait of an elderly person in your family, a picture which will be placed in the family album. In the case of a widowed grandmother, for instance, you could place a framed portrait of the old lady's husband in your photograph

Conversation *The best candid shots are taken when the photographer is unseen—wait until your subjects are relaxed and preoccupied*

Vautier/de Nanxe



Double portrait *Standing well away from your subject and using a long lens to close in is less overwhelming, particularly to older people*

which may evoke feelings of sadness or memories of happy times in the past.

Remember that your subject's response will be dictated by the way you handle the photographic session. One way of creating the right atmosphere for a portrait of an elderly person, who may be quite nervous when confronted by a bewildering array of modern photographic equipment, is to encourage them to talk about the past. Here you might learn something which could help you achieve an unusual and interesting portrait.

If your model is a war veteran he may have medals, honours or awards which he only brings out once a year for a formal dinner. Or your subject may have a collection of stamps, matchboxes, teapots or butterflies. It really does not matter what it is, but to include the old person's past, or their special interest or skill, should produce a different, or at least an interesting photograph. After all, old people have had the experience that younger people admire. Most of them are very proud of this fact.

Detail *You may be able to say more about a subject by concentrating on one feature or detail—such as this shot of weatherbeaten hands*

When you ask about your subject's past life, or about the objects that surround him or her, your questions are bound to cause some nostalgia. It will be largely up to you whether you wish to depict sorrow or joy. Be gentle and considerate with your questions. Many old people are suspicious or secretive, and a sympathetic approach may result

in a favourite object being removed from a dark cupboard and brought into the daylight.

It is worth remembering that many old people, deprived of friends and relations through death or illness, will form special relationships with their pets. Unkind observers may well say that the pet, be it cat, dog, budgerigar or what-



Trevor Wood



lady holding her newly born grandchild. On the other hand look for the baffled expression of the old man in the street when he is confronted by a crowd of colourful youngsters.

The mood of your photograph will depend not just on the people or objects you choose to surround your subjects with, but also on the type of lighting you select. If you are considering a formal approach, remember that natural light, especially if diffused somewhat, is a kinder medium than artificial light. Think twice before using flash, for this can be very disconcerting for an elderly model who may be genuinely confused as to what is happening. Bear in mind that the best way to achieve a good portrait is to have a willing and relaxed subject. A photograph taken in natural light enables you to decide which is the right moment to press the shutter. Sometimes, if you have been chatting during the setting-up time, you might be able to shoot a few pictures surreptitiously.

Lesley Nelson

Old and young One way of emphasizing the qualities of old age is to contrast them with those of a much younger person in the same shot

White cat Photographing old people in their own homes, using available light rather than flash, can give a personal, intimate picture

ever, is a child, husband or wife substitute. A more sympathetic view is that the animal is really a perfect friend for the elderly. It is loving and affectionate, dependant, and not too talkative! Portraits of old people with their pets can be extremely effective and very revealing of the person's character. We are all aware that just as people who live together for a long time can come to resemble one another, so human and pet can assume a curious affinity. Look carefully at old people with their animals—not just their expressions, but their stance or gait.

An old lady with her head cocked to one side may be talking to her canary who seems to be making the same gesture. A man in his best winter coat may be walking along with his dog who is also clad in a smart woollen coat. A woman peering out of a window, holding her cat, may be adopting the same expression of intense concentration as the animal. Such candid shots can occur at any time, so it is worth watching out for them with your camera ready.

The tenderness of old age towards youth, and the special communication that exists between widely differing generations can make for rewarding portraits of the old and young together. Double portraits of this kind make an immediate contact with the audience, and remind us of the inevitable progress from birth towards death. Look out for the striking difference in skin texture between the old and the young and emphasize this with careful lighting in your picture. Try to photograph the old



Mike Abrahams/Network

This is not possible if you have chosen to use flash.

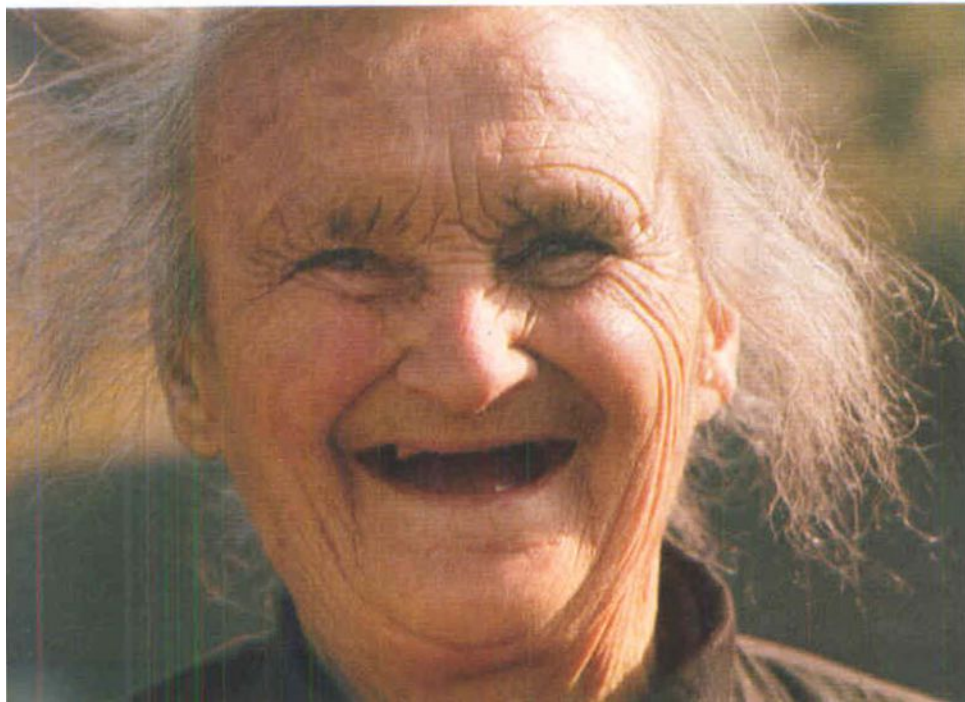
Shooting pictures informally can produce excellent results. Again, be aware that there is always a likelihood when you are photographing strangers that people may become conscious of your presence. Say there is a family group, in the park or on a beach, where a lot of members of different ages are gathered together enjoying themselves. Imagine the shot you particularly want is of grandparents admiring or playing with their grandchildren. You only have a few seconds to get the picture before someone in the family becomes aware of your presence. Once this happens, show yourself to be friendly and that you are enjoying, from the viewpoint of an outsider, the activity of the family group. Smile, indicate the camera, shrug and shoot the picture. You have taken the shot and chances are nobody will be upset. The secret is to judge the mood of the moment, and respond to it. Such a family grouping will probably be delighted that their happiness is being shared by someone else. You might even be asked to shoot a few for their album!

A photograph of an old person outside and alone is a more delicate matter calling for tact and judgement. Here the secret is to avoid any sense of intrusion on their privacy, and should your presence be sensed and objected to, you must respect their wishes immediately. If you have a telephoto lens, you might be able to avoid any problem of this kind, but results will show you that standing back from your subject has built-in disadvantages. The flattening effect of long lenses does not always yield a con-

Look at that! Photographs are often more effective if the subjects are distracted and are not staring directly at the camera

Laughter Occasionally you may be rewarded with a subject who really enjoys being photographed and your shots can say much about the sitter

Trevor Wood



vincing portrait, particularly in a situation you are not able to control. It is also difficult to place your subject in a recognizable background.

For example, an old person alone on a bench in the park taken with a long lens might allow you to make out details of expression, and include a portion of the seat. Behind, out of focus trees are all the lens will show. On a normal, or slightly wide angle lens, the shot shows that there is no-one else on the bench. A very wide angle lens can isolate that person on the bench, by showing quite clearly that there is no-one else around.

Ask yourself which of these you would choose as the more evocative and telling image. Each approach can tell a story or convey a mood, but in both cases the emphasis of the picture is quite different.

There is a danger of being over-cautious when lining up a subject. Some photographers lurk around with a lens

Jean Ber/fotogram



Back view People have backs as well as fronts! Even without the subjects' faces this shot is very expressive and a nice comment on old age too

Portrait A more serious study often works better in black and white than colour, particularly if you want to convey the subject's character



Mike Abrahams/Network

like a shotgun, stalking their quarry as if on a jungle expedition. Such behaviour, can often be as objectionable as a fish-eye lens jammed under the subject's nose. Bear in mind that most people do not object to their photographs being taken. (There are of course obvious exceptions. In some countries it is frowned upon, and photographs of the ill or injured may not endear you to those around.) Ask the subject's permission politely, and be prepared to stand up for your motives if questioned. You will find most old people flattered, if somewhat embarrassed, and mainly co-operative. In this respect they do not differ from anyone else. But do try leaving the telephoto in the camera bag, and go for the human touch. Your pictures will be all the better for it.

One area well worth exploring is that of traditional craftsmanship. Here the accent is very much on longevity, and many people work long past the usual retirement age once they have spent a long apprenticeship and a lifetime perfecting their skills. People who work with wood or glass, potters and painters, all make ideal photographic subjects. If you are able to convey a craftsman's skill, and something of the great concentration and attention the job requires, you are well on the way to achieving a worthwhile portrait.

For instance, Frederick Gandolfi, the only remaining maker of mahogany and brass plate cameras in England, and the last of his family line, poses regularly

for his portrait. This is usually taken by a contented customer, with a Gandolfi camera!

Another gathering point for the elderly which will provide you with a rich and varied choice of weather-beaten, experienced, perceptive and humorous countenances is the local country fair. Wherever animals are put through their paces, you are bound to spot lines of elderly experts who have seen it all before. Country people are curious and competitive in these matters, and love looking over other people's pets, livestock and associated interests. These sorts of gatherings are particularly suitable for candid or intimate studies since your subject's concentration is directed elsewhere, and there is a great deal going on all around. Not just fairs, but gymkhanas, country races and markets offer plenty of rewards for the patient photographer.

Many elderly people are very active, and some sporting events organize special 'veteran' events. Tennis, golf and bowls appeal to a broad age group, and can be played well into old age. All activities where skill rather than physical strength is the main ingredient are worth keeping an eye on, such as darts, chess, card games and pool or billiards. You are sure to find a number of elderly, intense and concentrated faces, not only among the spectators but the competitors as well! Such situations allow you to set old people in a particular environment and show them at their best.



Darkroom

Prints from slides-1

If you are put off 'normal' colour printing from negatives by its apparent complexity, then consider making prints from slides with a processing kit, such as the Cibachrome-A discovery kit

Many photographers are put off making prints from colour slides by disappointing and expensive commercial results. But with thorough attention to detail, prints made from slides at home can be as good as the best prints from negatives.

If you are used to printing from negatives, you may think that making

prints from colour slides involves complicated techniques. In fact, printing from slides can often be simpler than printing from negatives. Unlike negatives, though, slides give a positive image on the enlarger baseboard. So you can make your estimates for colour filtration on the basis of the colours as

they appeared in the original scene, not as complementaries.

Paper for printing from slides also allows a far wider margin of error in exposure and colour filtration. In fact, you can dispense with the coarse and fine filter tests which are normal for negative printing, and make just a single exposure test and a single filter test. These two tests will serve for a complete batch of similar slides. Most slide paper can be also processed at temperatures anywhere between 20°C and 28°C—a range normally only acceptable for black and white processing.

There are two systems for home printing of colour prints from slides. This article explains the Ilford Cibachrome-A process: a subsequent article covers the Kodak Ektachrome R14 system and the similar Agfachrome PE system. Ilford market a special version of the Cibachrome-A system in a 'Discovery Kit'. This contains almost everything you need to make prints from slides in an ordinary darkroom. As well as a comprehensive and very informative manual on the process, the kit contains developer, bleach, fix, neutralizer, three measuring cylinders, a packet of paper, a developing drum and a selection of colour printing filters.

Paper for the Cibachrome process comes in two forms: a normal resin-coated paper; and a version that is not really 'paper' but a thin layer of plastic

Slide print

Cibachrome can produce very good quality images. The kit (below) contains almost everything you need to make your own prints from slides. The printing and processing stages are both quite straightforward and give good results



Kate Salway



Jon Bouchier

Printing Cibachrome



1 Clean the slide carefully before placing it in the negative carrier, if necessary removing the slide from its mount beforehand



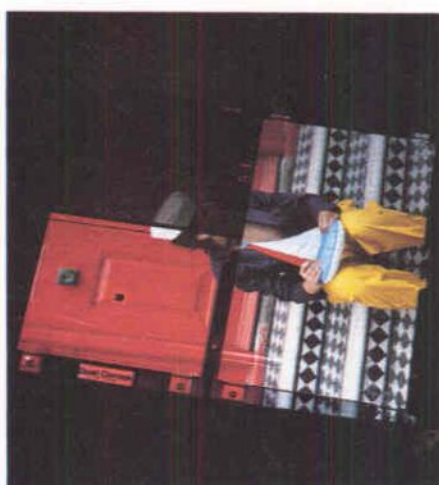
2 Check the label on the back of the Cibachrome packet to find the starting filters for your slide film. Place these (+UV) in the filter tray



3 For a quadrant test, you need to use a mask. You can cut one from the piece of card supplied in the Cibachrome packet. Remove one corner only



4 You may find it worthwhile investing in a purpose-made four-flapped masking easel, such as the Durst Comask here, for making separate test exposures



5 In complete darkness, remove a sheet of Cibachrome and place it on your easel. Expose the first quadrant for, say, 25 seconds at f/16



6 Complete a range of test exposures (as shown opposite) simply by adjusting the apertures. The lightest quadrant (f/5.6) is best but too yellow

carrying three emulsion layers. Colour dyes are produced in these layers after processing, and these combine to form a colour positive image. The emulsion side of the paper is dark brown before development. You can identify this side in darkness by stroking the extreme corner of a sheet with a finger nail. The underside 'rustles' slightly and does not feel as smooth.

Paper should not be stored anywhere warmer than 20°C and if kept for periods of a month or so should be stored in a refrigerator. Paper kept in a refrigerator should be sealed in its original package. Remove it from the refrigerator a few hours before use so that it slowly returns to room temperature.

Like all colour paper, Cibachrome paper is extremely sensitive to all forms of light. There is no 'safe' light and it should be handled only in absolute

darkness. The only time it should see the light is during the actual exposure. Once opened, the bag should be double folded and taped. Try to prevent any stray light from the enlarger or timer reaching the paper.

The chemicals

The Cibachrome process involves three main stages—development, bleaching and fixing—and a final wash and dry. Cibachrome developer is similar to developers for black and white work and, in fact, is used to produce a black and white negative image. The colour image is actually formed in the bleach bath, which is really the key to the Cibachrome process. As well as reversing the image to positive, it also bleaches out the unwanted dyes in each of the emulsion layers.

Follow carefully the maker's instruc-

tions for diluting the various powders and liquid concentrates. For comfort, prepare the solutions in a well ventilated room. Some of the chemicals are harmful and you should wear rubber gloves while mixing and using the solutions. Put all the chemicals safely away in properly labelled bottles when you finish.

The bleach, in particular, is extremely corrosive and must be handled and disposed of with great care. Untreated bleach can severely damage exposed metal finish on sinks and worktops. You cannot simply throw used bleach down the sink, it must be properly neutralized. Each kit contains neutralizing powder for the bleach and a capful of this should be put in a suitable waste container each time a print is made. Used developer, fixer and bleach removed from the processing drum must also be put into

Start the processing sequence by holding the drum vertically and pouring in the measured quantity of developer. Check the temperature in the developer reservoir immediately, holding the thermometer bulb well below the surface. If the temperature has dropped at all, you must adjust the developing time accordingly.

Developing time is two minutes at 24°C but remember that this includes the time taken to empty the old solution and pour in the new. A tank such as the Cibachrome/Durst takes 10 or 15 seconds to drain completely, and there is a delay of about 5 seconds as the new solution starts to work. To allow for this, you must begin to pour out the developer after 1 minute 40 seconds. To start development, tip the tank on its side and then roll it evenly backwards and forwards, rolling it at least a full revolution in each direction. When the developing time is up, pour the used developer into a container containing neutralizing powder.

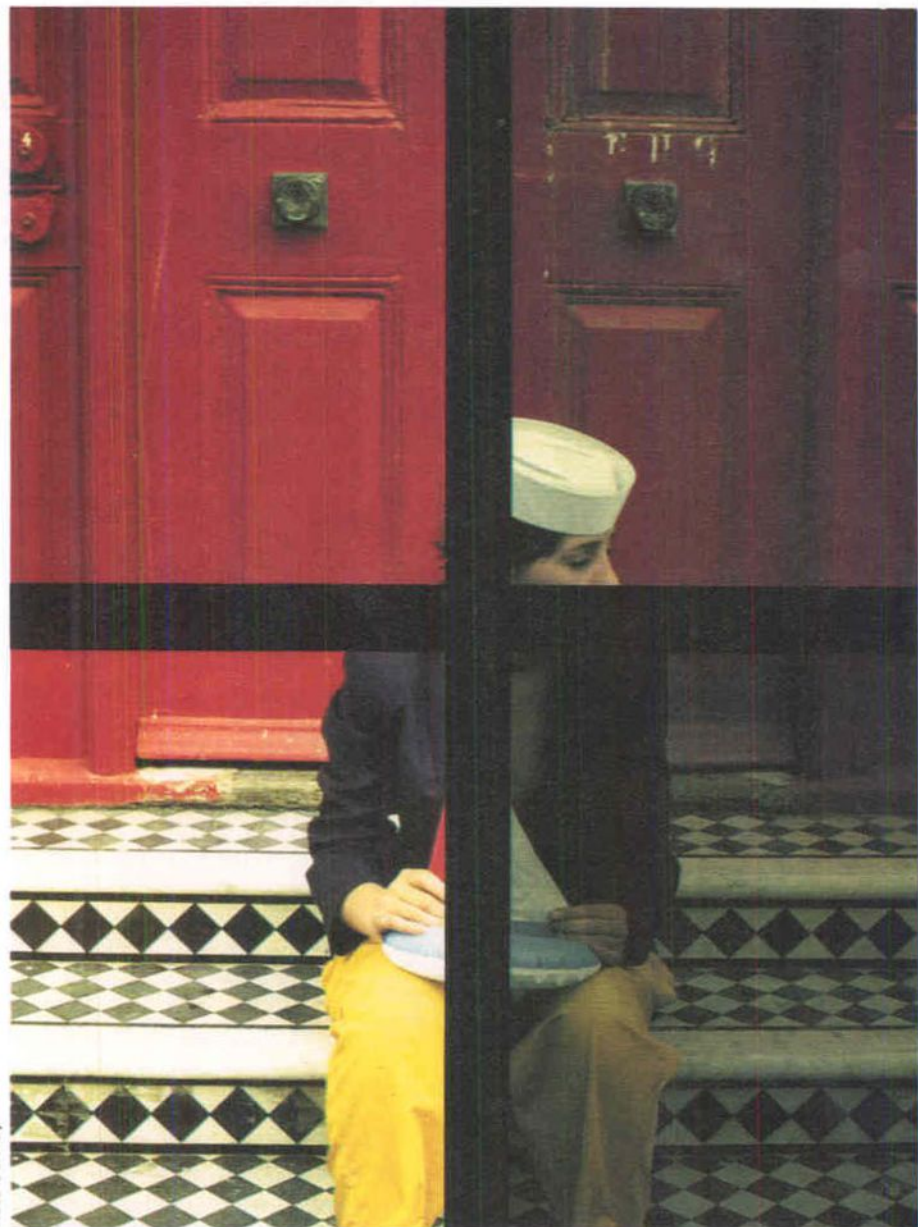
For the bleach and fix stages, follow the same procedure as for development, but beware of cutting short either of the two baths. It is usually better to allow the bleaching and fixing to go on slightly longer rather than risking incomplete processing.

While the neutralizer is at work on the discarded solutions, remove the print from the drum and wash it for 3 minutes in running water at 24°C. Take great care when removing the print from the drum as a fresh wet Cibachrome print has a very soft surface that is very easily scratched and damaged.

After washing, lay the sheet on blotting paper and remove excess water. It takes about two hours for prints to dry naturally as the emulsion layers are very thick. You can use a hot air fan, such as a hair drier, to dry prints in five to ten minutes, but do not damage the print by overheating. Only when it is completely dry can you assess the true colours of a Cibachrome print, since wet Cibachrome has a reddish tint.

Your enlarger

All the necessary filters for colour printing are contained in the Cibachrome kit and providing your enlarger has a filter drawer, a good lens and a fairly bright lamp (100 or 150 watts), filtration and exposure should prove simple. If your enlarger has no heat absorbing filter, however, it may be worth installing one to protect your slides and filters from the heat of the lamp. You can, of course, use a colour head for printing slides if your enlarger is fitted with one. A good quality enlarger lens is essential for top quality results. Cibachrome yields an exceptionally sharp image, and it would be a pity not to take advantage of this valuable characteristic by using a lens of poor quality. To maintain full colour saturation also make sure that you contain all possible sources of stray light in the darkroom. Make a special check of any temporary blackout.



Kate Salway

this waste container for neutralizing. When you pour in the waste, it will start to froth. This is nothing to worry about—it is simply the neutralizer working. The waste can be thrown away only when the frothing stops.

You must also use neutralizer powder before mixing any of the discharged chemicals to prevent a foul smell from the sulphur dioxide that is otherwise unleashed.

The print drum

The Cibachrome process normally uses a print drum, like that for processing prints from colour negatives. It must be perfectly clean and dry before processing begins. The exposed print is loaded in total darkness with the emulsion side facing inwards. Once the top has been replaced, the print can be processed in normal room lighting.

Processing Cibachrome

With the Cibachrome kit, processing is relatively straightforward and, providing you pay close attention to detail, you should have no problems.

Mix and prepare the solutions in bulk to provide a reservoir for the whole session: draw off measured quantities of solution from these reservoirs for each individual processing cycle. Place the reservoirs in a water bath well before you start to bring them up to the correct processing temperature. The optimum temperature is 24°C but Cibachrome can be used at various other temperatures.

When you have loaded the print drum, measure out sufficient developer to process the print into the appropriate numbered beakers. The quantity required varies from drum to drum: the Cibachrome/Durst drum, for instance, needs 90 ml of solution.

Printing procedure

Slides that have a wide contrast range do not print very well and you should begin with a fairly soft looking slide—preferably one that is completely sharp and perfectly exposed. Try to select a slide that has a good range of colours, including skin tones and this print can be used as a reference for the future.

Before placing the slide in the negative carrier of the enlarger, remove it from its mount and use a blower brush to remove any specks of dust.

Like colour negatives, some colour correction is needed with slides to give good colour balance. This can be done either with normal colour correction filters in a filter drawer or with the enlarger's colour head, if it has one. Filters for printing from slides are, like those for subtractive printing from negatives, in the complementary colours:

yellow (Y), magenta (M) and cyan (C). They are usually referred to in this order. The filtration needed for a particular slide can be written in the form (50 30 00), which signifies a 50 yellow, a 30 magenta and no cyan. You should never use all three colours together, and use as few as possible in each filter pack.

A table of suggested starting filter values for different makes of slides are printed on each pack of Cibachrome paper. These batch values vary and Ilford carry out tests on each batch of paper to find out the closest starting filters to use. A typical filter pack combination might be (10 00 00) for slides taken on Kodachrome, (15 05 00) for Ektachrome, (15 10 00) for Agfachrome, and (20 05 00) for Fujichrome. Older transparencies and those taken under studio lighting will usually need stronger filtration.

Start the printing sequence by preparing the suggested filter pack. An ultraviolet absorbing filter (supplied in the Cibachrome filter set) must be incorporated within the pack to eliminate ultraviolet from the enlarger lamp.

The first test print is used to establish the correct exposure for the type of slide you are printing. Use a complete sheet of paper for the test rather than a small strip. This not only makes processing easier—because a full sheet fits more securely in the drum—but also makes judging exposure easier on a print with a wide range of colours. Because of the wide exposure latitude of Cibachrome, try fairly large exposure steps to start with.

Ilford recommend a 'four-square' test, altering the enlarger lens aperture rather than using different exposure times. A separate exposure of, say, 25

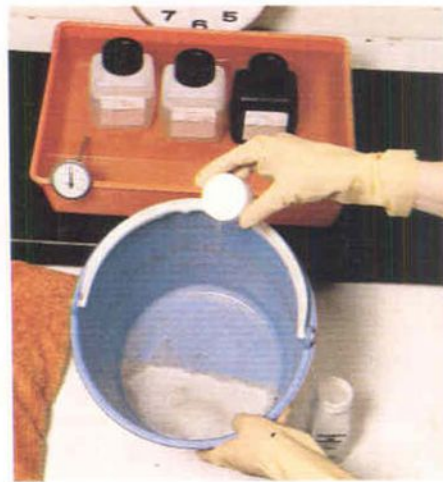
Processing Cibachrome



1 Mix up the various process chemicals following the maker's instructions. Take care to avoid splashes and direct contact with the chemicals



2 Pour enough solution for your immediate needs into containers placed in a waterbath at the correct process temperature. Store the rest



3 Before each print, measure off a capful of neutralizing powder and pour this in your dump bucket which should be empty of previous solutions



5 Check that solution temperatures are at the correct level. Measure off some developer (typically 90 ml), charge the drum, and tip this to begin the process



6 Remembering to allow for draining and recharging in your timing, pour off the developer and continue with the bleach and fix, neutralizing as you proceed



7 Wash the print in the drum or, better still, in a dish for 3 minutes under running water. The print can then be blotted and dried as usual

seconds, is made on each quarter of the print and for each exposure the lens aperture is changed, giving exposures at $f/5.6$, $f/8$, $f/11$, and $f/16$, for example. This is fine if you have a good quality enlarger lens and have focused the printing image sharply but may allow little margin for error if the correct exposure requires an aperture of $f/5.6$ or wider. If you find it difficult to achieve pin-sharp prints using this method, repeat the test but keep the aperture constant and try varying the exposure times. Avoid exposures longer than a minute.

The most convenient way to make four separate exposures on a single sheet of paper is to use a four-flapped masking frame. A cheaper alternative is a print-sized piece of card with one quarter cut away. The Cibachrome paper pack contains two suitable pieces of card. All

Ian McKinnell



Abstract in shadows Sharpness and good red and black reproduction are Cibachrome's strong points—capitalize on these by carefully choosing the slides you print and avoid using high contrast slides

tests and exposures should be made in complete darkness. Make sure the print drum is ready, and can be easily and safely located once you have switched off the enlarger light.

After making the test print, process the print and examine it to establish the correct exposure. Unless you have the correct exposure, you cannot assess colour balance correctly. If none of the exposures gives the right density, you must repeat the test until you are sure of the exposure. An important thing to remember is that unlike neg-pos printing, if you want a darker image you give less exposure, and if you want a lighter image you give more exposure.

Properly dry the print before making any judgement on colour balance, and view the print and slide by daylight (reflected off white paper) whenever possible. If you have to make your assessments in artificial light, make a point of comparing the print and its slide under comparable conditions.

One substantial advantage of printing from slides is that you can compare your test prints directly with the original slide and judge more easily what corrections are needed. Quite the opposite of negative printing, for slides you remove a colour cast by reducing the amount of that colour in the filter pack. For example, a magenta cast is removed by reducing any magenta filtration (the same effect is achieved by adding complementary yellow and cyan filtration). Excess blue is removed by reducing magenta and cyan filtration or by adding yellow, blue's complementary.

If, on the other hand, you want to add a colour, you simply add filters of that colour or reduce those in its complementary. If you want more red, for example, you would increase the yellow and magenta or reduce the cyan.

Since filters absorb part of the printing light, the original exposure for the first print may have to be adjusted slightly according to the strength of the filters used in subsequent prints. These factors range from $\times 1$ to $\times 1.1$ for the yellow Cibachrome printing filters; between $\times 1$ and $\times 2.1$ for the magenta filters; and between $\times 1$ and $\times 1.6$ for the cyan range. These adjustments are made in exactly the same way as when printing from negatives (see panel on this page), but because of the wide latitude of Cibachrome, they do not have to be so strictly applied.

Once the right exposure and filtration have been established you can go on to make your main print. For subsequent slides, you may be able to use the same exposure and filtration, providing they are fairly similar. Even if this is not quite right, it may still be a good starting point.

If you do not like the black borders produced by masking frames, conventional white borders can be produced by cutting a card mask slightly smaller in area than the print and placing it on the print after exposure. Carefully position it before opening up the lens and exposing the border for several times the original exposure. The border is then severely overexposed and appears white on the print. However, to make sure you get a perfectly clear border, it is best to remove the slide from the negative carrier before making this second exposure.

During the printing sequence, take note of all relevant exposure information. You will find it helpful to label each print accordingly. This information can be extremely useful when making similar prints in the future.

Taking notes is really rather important in any form of colour printing and you will find it well worth your while to establish a routine that correctly links up a processed print with exposure notes made immediately after printing. Use a soft lead pencil to number the back of each print. Later, transfer the appropriate exposure information to the back of each print.



4 After exposing the print, place it emulsion side inwards in a cleaned and dried print drum. Handle the print by its edges only

Cibachrome filter factors

A set of printing filters is provided with the Cibachrome Discovery Kit. As any filter absorbs part of the light, a correction factor is used to maintain correct density during printing. This varies with the filter used:

Filter value	Yellow	Magenta	Cyan
00	1.0	1.0	1.0
05	1.1	1.2	1.1
10	1.1	1.3	1.2
20	1.1	1.5	1.3
30	1.1	1.7	1.4
40	1.1	1.9	1.5
50	1.1	2.1	1.6

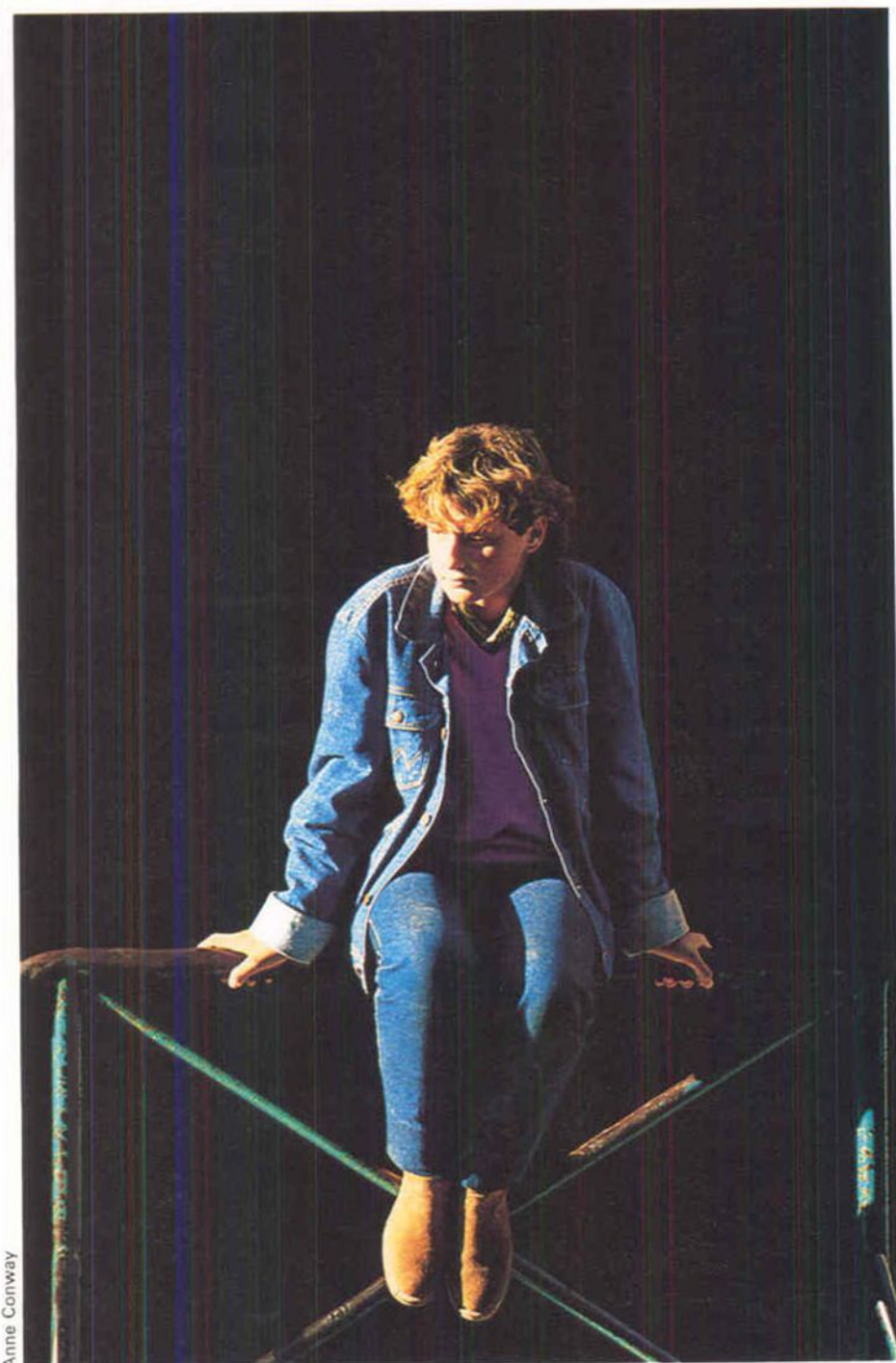
If you make your first print using the suggested starting filters, but colour correction is needed, find the new exposure by multiplying the original time by the new filter factor and dividing it by the original factor



Improve your technique

Coping with contrast

In certain light, some subjects show too great a contrast range, but you can correct this and make better pictures using a few simple lighting techniques



Anne Conway

Fence sitter A high contrast range need not cause too many problems as long as you take your exposure reading from the main subject and accept that less important parts of the picture will be either under- or overexposed

In the early days of the camera, photographers would often wait for the sun to come out before shooting and, even today, a bright sunny day seems the ideal time for taking pictures. Unfortunately, too much light can often create just as many problems for the photographer as too little light.

In strong sunshine, the difference in brightness between the brightest highlights and the deepest shadows—the contrast range—may be so extreme that even the most versatile modern film cannot cope. The photographer must therefore expose either for the highlights or the shadows. If you expose for the highlights, detail in the shadows will be lost: if you expose for the shadows, high-light detail and colour may be lost. This can be particularly unpleasant with portraits, where one side of the face is properly illuminated but the other is in deep shadow. Strong sunshine also throws harsh shadows over the subject.

You can, of course, wait for the sun to go behind a cloud or move your subject into the shadow, but this can create just as many problems as it solves (see page 278). A better solution is to illuminate or 'fill in' the shadows.

The easiest and cheapest way to add fill-in light is to use reflectors. You can buy specially made reflectors in a range of sizes, but virtually any light coloured surface can act as a reflector. You probably have several potential reflectors in your home. Sheets of white card or paper, mirrors, kitchen foil stuck to boards, even sheets and towels are all suitable. But do not restrict yourself only to portable reflectors. Look for natural reflectors in the landscape such as bright sand or whitewashed walls.

To be effective, a reflector must catch

Portrait Exposure has been set to give normal tones on the face, while the background has been made much less obtrusive by underexposure





Reduced contrast The overall contrast range of the subject can be reduced if a reflector is used to throw light into the shadows. This gives a more pleasing result



Sunlight contrast The bright light of the sun can be too strong for many subjects. Harsh shadows may result, particularly when colour slide film is used

light from the sun and reflect it into the shadows on the subject. This means that it has to face the light and point towards the subject. Remembering that light is reflected from a surface at the same angle at which it hits the surface, you can work out theoretically the ideal position and angle for your reflector. In practice, though, it is much simpler to set up fill-in reflectors by eye. Adjust the angle and tilt of the reflector until you get the effect you want. If you have a friend with you, ask him or her to hold the reflector and aim it at the subject while you look through the viewfinder. Make sure that the reflector itself is not visible at the edge of the viewfinder. When you are working on your own, this may call for



Placing a reflector In bright sunshine, a small white board can be used as a reflector. Prop it in a suitable position facing the shadows

more careful adjustment of the reflector position. Rigid reflectors can usually be leaned against some firm support, while flexible reflectors such as sheets or towels can be taped to or stretched over a suitable support.

You can check the brightness range of the subject with a light meter (see page 364), but it is quicker to estimate the effects with your eyes. But remember that your eyes can see more than the camera, so always add slightly more fill-in light than appears to be necessary.

Reflectors are invaluable in many situations. With backlit shots, for instance,

all detail may be lost unless you properly illuminate the front of the subject. Use a reflector approximately at the camera position to throw light back onto the subject. With subjects lit strongly from the side, place a reflector on the opposite side of the subjects from the sun.

Fill-in flash

Using a flash gun to brighten the shadows is another way to control contrast outdoors. It does not matter whether the flash is a manual or automatic unit, although there are differences in the techniques involved for each type.

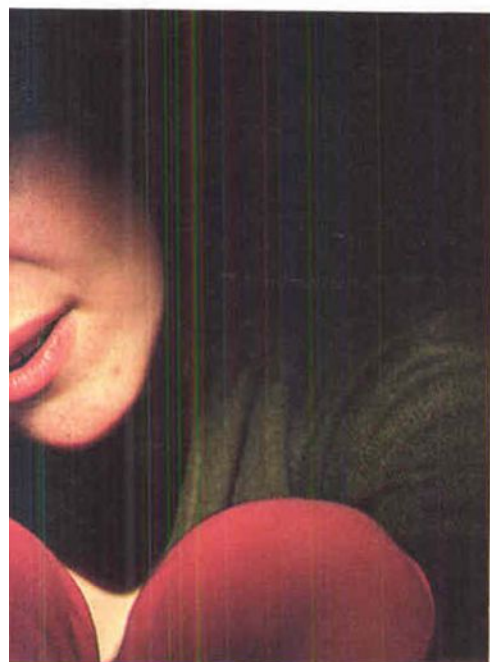
When you use fill-in flash always remember that the object is not to use flash as the main light source. Outdoors this would produce an unnatural effect, and in any case would require a very powerful flash gun with most normal SLR cameras. You should always give less exposure when using a flash gun as a fill-in than you would when using it as a main light source. As a rule of thumb for most subjects, work out the exposure you would use if you were using flash as the main light, and then close down the aperture one stop.

Procedure

First set your camera to the correct shutter speed to synchronize with flash. With most cameras with focal plane shutters this is 1/60, but some focal plane shutters synchronize at up to 1/125, and between the lens shutters synchronize at all shutter speeds. Refer to your camera's instruction book for guidance.

Next take a light reading of the general scene and set the aperture the meter recommends to suit the flash synchronization speed.

If you are using a manual flash gun, the distance from the flash to the subject





Flash outdoors As an alternative to reflectors, use a portable, electronic camera-mounted flash to balance the subject shadows with the highlights

affects the exposure given by the gun. However, since the exposure that you set on your camera is determined by the amount of light falling on the subject from the sun, there is normally only a limited choice of apertures, and hence flash to subject distances available. For example, if you have loaded Kodachrome 25 in to your camera your exposure in bright sunlight would typically need to be about $1/60$ at $f/11$. Your flash gun would need to be positioned at the correct distance for making an exposure with the aperture set one stop wider, at $f/8$. If you have a close-focusing zoom lens, you can mount the flash gun on the camera and move both camera and flash to the appropriate distance. Then you can reframe the picture with the zoom control. The alternative is to put the flash gun on a long synch lead so that you can adjust the distance of the flash gun without moving the camera.

With an automatic flash gun your distance from the subject may be varied up to the maximum distance given by the flash at that particular aperture. For example, with your camera set at $1/60$ at $f/11$, you should set the flash gun so that it would give correct exposure if the lens were set at $f/8$. Not all automatic flash guns allow you to choose your aperture settings in this way; if yours does not, set the gun on manual.

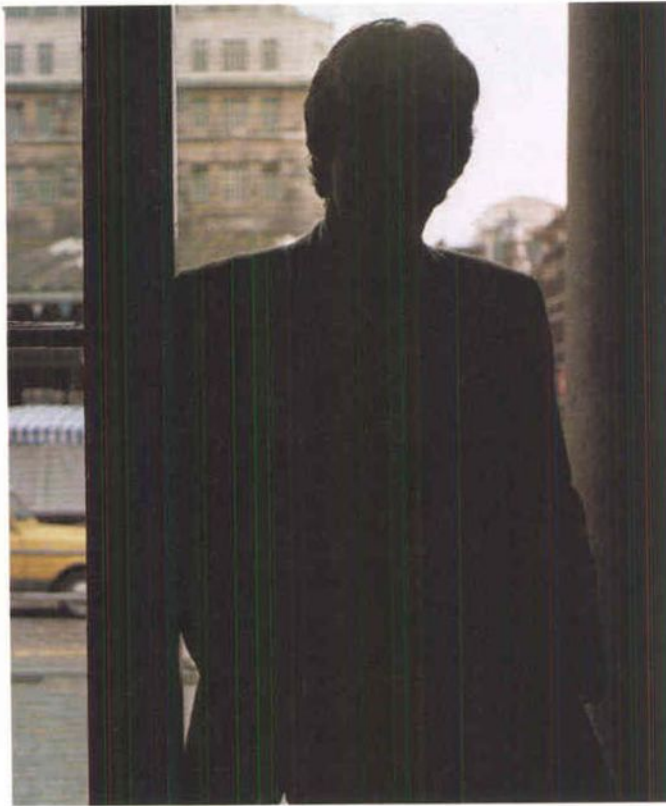
In order to produce enough light to be used for fill-in flash at distances suitable for full-length portraits, a fairly powerful flash gun is necessary. This is not surprising, if you think about how the

exposure is made up. A small electronic flash gun delivers all its output in no more than $1/500$ sec. Yet the construction of focal plane shutters means that the powerful light of the sun has $1/60$ sec to affect the film, and the aperture must be set to match this. Therefore you must move in close to your subject, to make the most of the power you have, or use a more powerful flash gun than most amateur units, or use a camera with a between the lens shutter so you can set a faster shutter and a wider aperture.

Moving in closer is the simplest answer, but may create problems with composition and framing. Fitting a wide angle lens can help, but only if your flash produces a broad enough beam to cover the view angle of the lens. Nevertheless, since many scenes where you want to use fill-in flash have a central subject with a brightly lit background, your flash gun need not have such wide coverage as would be necessary in more routine uses.

Buying a more powerful flash gun is a worthwhile course of action if you use fill-in flash often. The main disadvantages are the cost and weight of really powerful flash units. Automatic flash guns powerful enough to give you plenty of distance between you and your subject are usually large units with separate power packs.

Professional photographers often buy roll film SLRs with between the lens shutters because they synchronize with electronic flash at all speeds, in addition to their other advantages. This too is an



Balancing flash and daylight Exposing for the scene outside gives a main subject that is too dark. Exposing for the subject would wash out the exterior

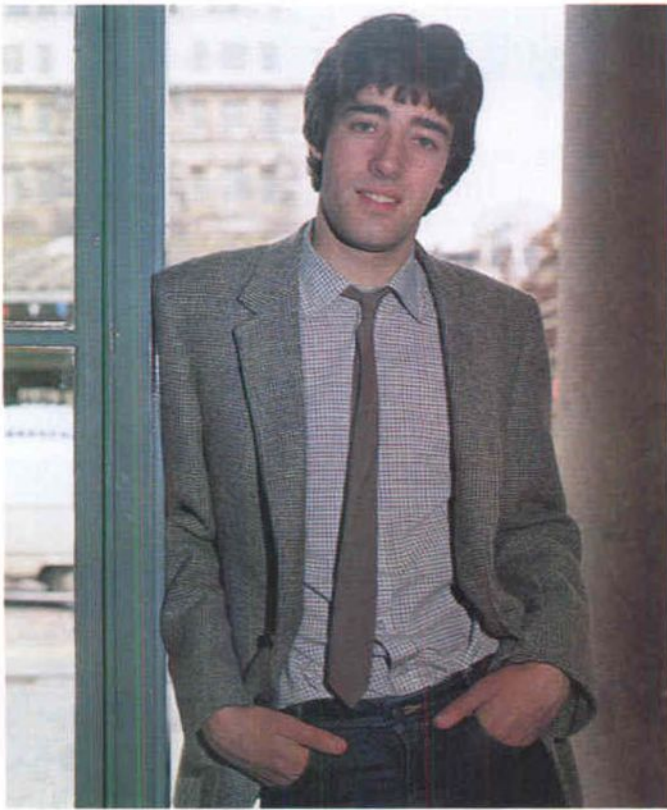
expensive way of making fill-in flash pictures, but you need not go quite so far. Most compact rangefinder cameras have between the lens shutters that synchronize at all speeds, although sometimes their instruction books are not completely clear about how they may be used with this technique. If you have a compact rangefinder camera, experiment with a roll of colour slide film at various combinations of aperture, shutter speed and (with automatic flash guns) flash output to find a setting that gives you the results you want. You are likely to find that a compact camera, which you may have as a 'second' camera, is more suitable for this sort of work than a more expensive SLR.

Fill-in flash experiments

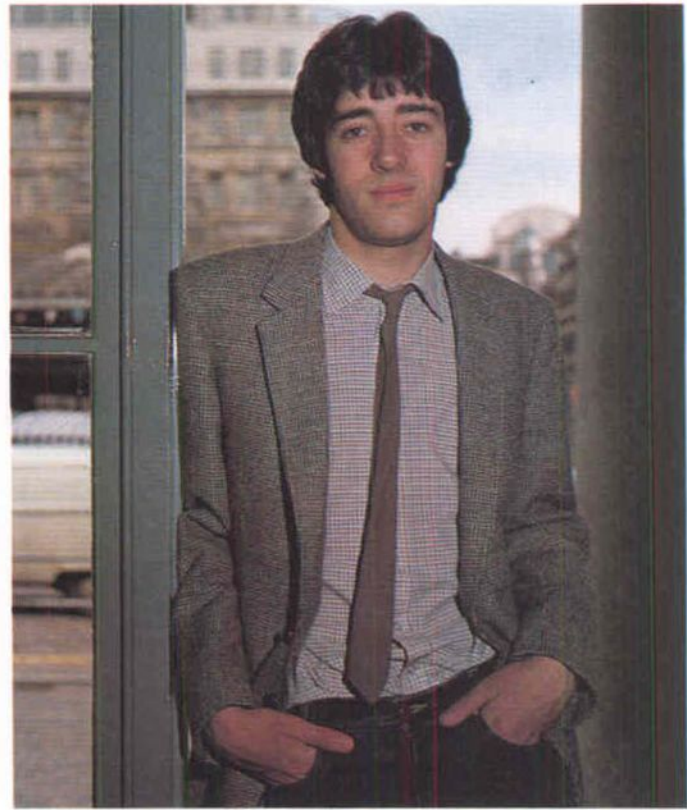
Fill-in flash is a technique that lends itself to a large number of variations. Most experiments are made much easier by using an automatic flash gun, but a manual flash gun can be used.

The first variable you can alter is the ratio between the fill-in flash and the natural light. Setting a lens aperture one stop smaller than that indicated by the flash calculator dial provides a level of fill lighting that may be stronger than you need. For a less obtrusive effect, try setting an aperture another stop smaller than that indicated by the flash calculator.

The opposite approach is to make the electronic flash the main source of light in your picture, and use the natural light for fill. Since this means using a sufficiently high flash output to overpower the



Adding flash With a focal plane shutter, you may be forced to use a relatively slow shutter speed. This can cause overexposure of exterior scenes



Steve Mansfield

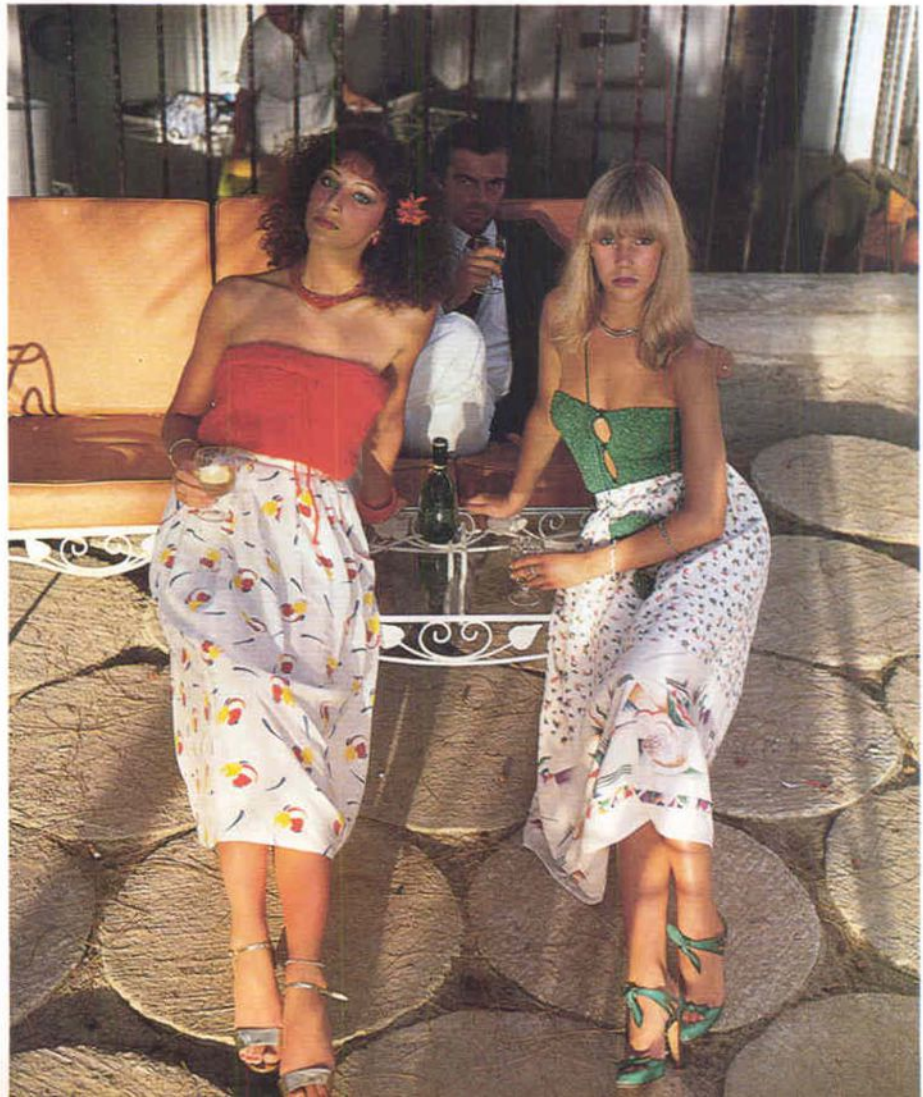
Balanced light levels A between the lens shutter allows you to set a higher shutter speed to control the effect of existing light. Interior and exterior are correct

natural light, the natural light must be relatively dim. In late evening or on very cloudy days you may be able to achieve these conditions. Simply set the lens aperture to the setting indicated by the flash dial and work in the normal way.

A technique that has been used to good effect by fashion and creative photographers is to use flash combined with a long shutter speed. In low light this produces an interesting blur effect in the background of your photograph, while the foreground subject lit primarily by flash remains sharp. Since the subject is lit twice, by both natural light and flash, you must close the lens down a stop smaller than the indicated meter reading to avoid overexposure, and use this aperture as the basis for your flash setting. Use a slow film so that you can set a sufficiently slow shutter speed to produce a blur effect.

Other effects involving the use of gelatin filters, taped over the flash tube, are possible. Try taping an 85B, which balances tungsten film to daylight, over the flash tube and loading tungsten film into your camera. In daylight, subjects within the range of the flash are reproduced with approximately their normal colours, while the rest of the picture becomes a pronounced twilight blue. Other possible combinations can be found by experiment.

Fashion shot An 85C warming filter was taped over the flash tube to fill in shadow detail without affecting the colour balance and mood of the picture



Jean-Claude Volpeliere/Marshall Cavendish

A saddler's bench

A craftsman may spend half a lifetime developing a skill but in a single day a photographer can produce an accurate and attractive insight into the care and precision involved

The skills of a craftsman are precious and rare—the knowledge and expertise involved in making an object as intricate as a horse's saddle can only be passed on by years of close working contact between the experienced master and his apprentice. For this assignment we look at the work of Les Coker who has worked as a saddle maker for 54 years. Saddle making, like many other traditional crafts is an intriguing process to watch and the skill with which the craftsman manipulates his tools and materials offers the photographer some challenging subject matter.

From a photographic point of view, a craftsman's workshop also contains plenty of opportunities for still life shots: the colours and textures of the well used and unusually shaped tools; the raw materials and the finished product. Coupled with the thought that certain crafts may be gradually dying out, such subjects also have an importance for the photographer interested in making a documentary record.

Victor Watts decided that his photographs of the saddler should try to retain the atmosphere of the man and his surroundings. This of course depended much upon his use of light, and fortunately the workshop was fitted with a large south-facing window which filled the room with enough daylight to provide Victor with his primary source of illumination. Had he used flash as his



Workbench The shape, colour and texture of the tools have their own intrinsic appeal. Here their arrangement has been exploited by the careful use of a 24 mm lens, enabling foreground and background details to be balanced.

Craftsman Victor also included the tools in this portrait to give some clues about the man and his work



main light source, the subtle colours would have appeared less warm and it would have been difficult to maintain the appearance of texture in the leather and wooden-handled tools.

Worn, old-fashioned instruments of antique design still make up the tools of the trade in high quality saddle making. Victor decided to feature these prominently in his shots—both as still life subjects, in their place on the workbench—and as working parts of the delicate process of actually making a saddle. The skilled hands of the crafts-





man using his tools offered Victor excellent opportunities for getting in close, which helps to give the observer a feeling of being involved in the activity.

Although the daylight offered excellent modelling qualities, it also created high contrast between the shadows and the highlights. To overcome this problem, Victor either used a reflector to direct some light back on to the subject, or he used a flash head fitted with a brolly to bounce some extra light back into the darker areas. This also had the effect of 'cleaning up' the whole scene while retaining the warmth of the natural light.

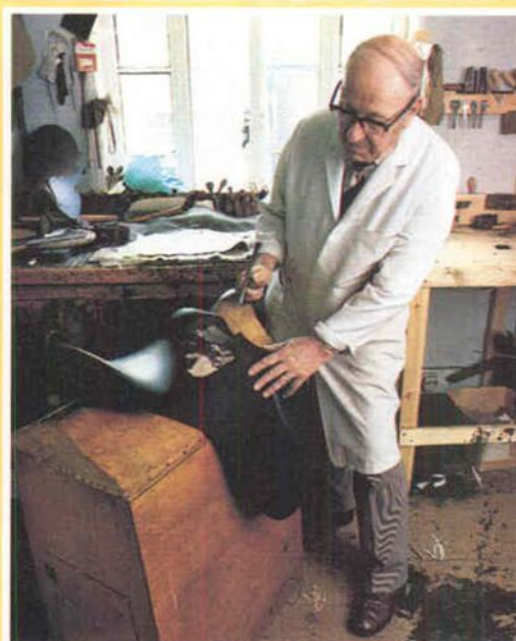
A brolly is invaluable in such situations as the diffuseness which it gives is very similar to that of daylight streaming through a window. The typical appearance of undiffused flash, with sharp shadows to one side of objects, is therefore avoided. Victor aimed to make sure that the casual viewer would not notice that there was additional lighting.

Use of fill-in flash was essential for the wider shots which included a large part of the room. For a situation like this, when the light reading for the natural light was $f/8$ at a given shutter speed, Victor used the flash as if the aperture were one stop less, $f/11$. This makes the flash effectively underexposed but the available light makes up for this.

Photographing a craftsman at work is not an especially difficult subject. Thinking carefully about the subject itself and using the appropriate lighting form the key to the approach. Be on the look out for harmonious colours and settings, here the warm tones of the wooden-handled tools on the bench and the rich, textured leather.

Close-up For a skill which depends so much upon the hands, a close shot like the one above is an obvious choice.

Tools A group of tools also caught Victor's eye and he used both fill-in flash and reflected light to bring out the rich colours and textures. Fill-in flash was used for all the wider views





Creative approach

Street life

Life in the streets can provide a rich and varied source of material for the observant photographer.

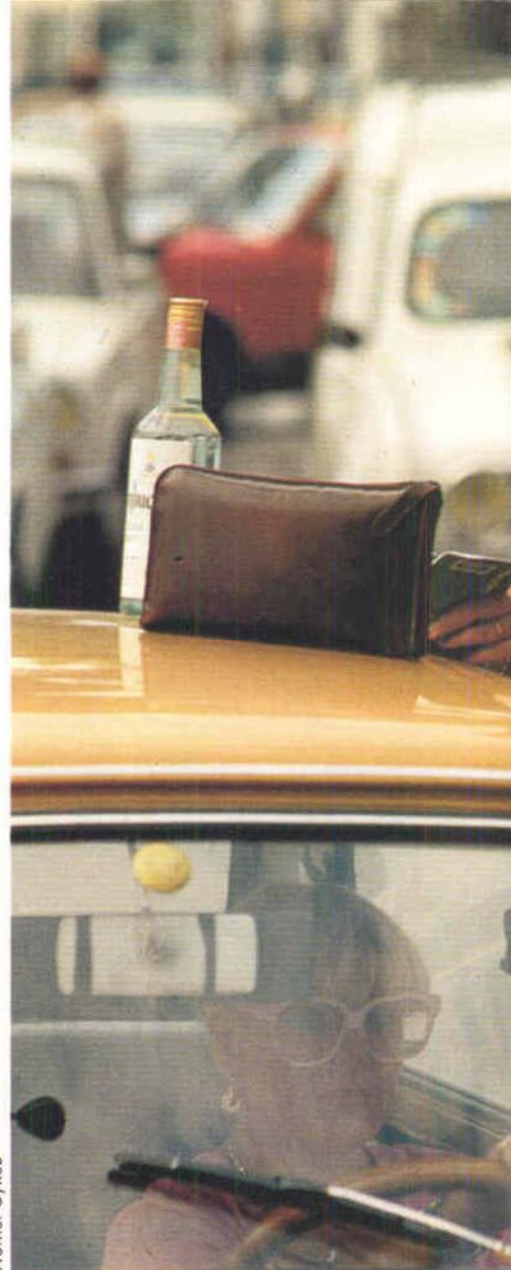
Yet it is so familiar that it is easy to overlook

If you live in a large town or city, one of the most varied and rewarding of all photographic subjects could be literally on your doorstep.

New and unfamiliar streets in strange places always awaken the interest of the keen photographer. But do not forget that similar opportunities exist on your own doorstep, and it can be both challenging and instructive to explore the possibilities of a familiar location—

whether it be a suburban street, a village square or an urban landscape of office blocks.

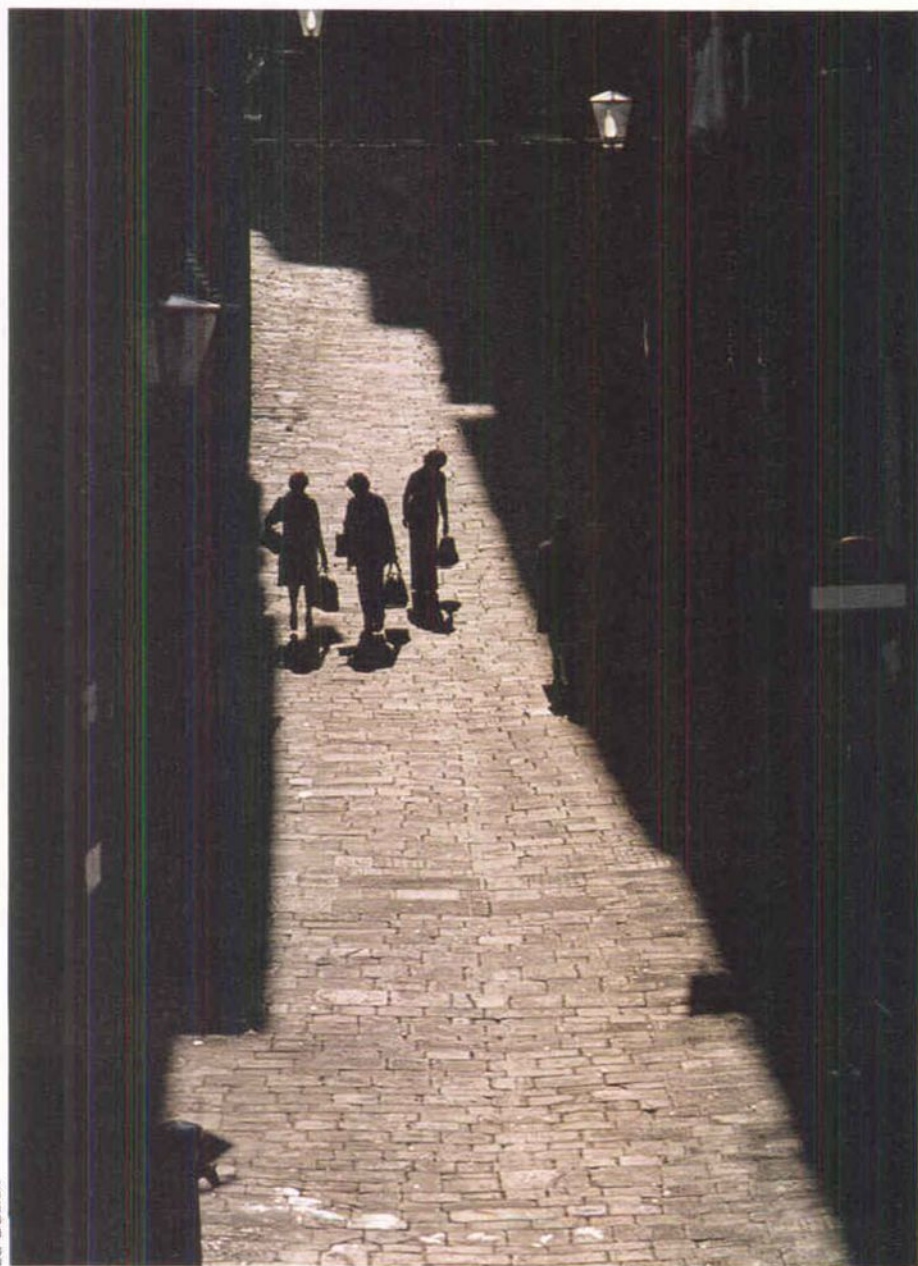
Most photographers experience periods of 'picture blindness'—the inability to find inspiration—and wish to go somewhere new and exciting to overcome the problem. But often it can be more effective to meet the challenge of finding new pictures in familiar places. The life of a street near your home or



Homer Sykes



George Wright

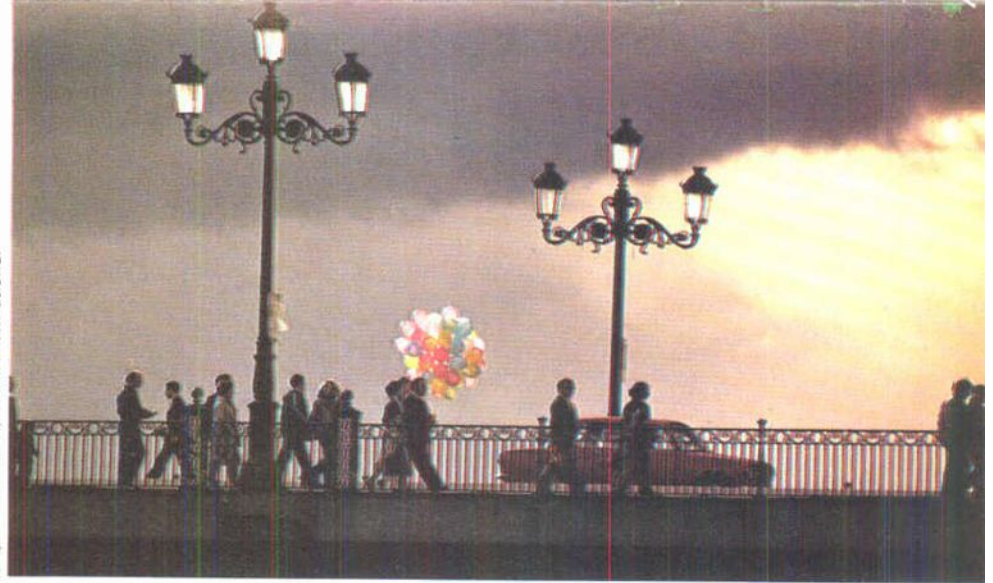


Ed Buziak



Hoyer: Snowden/Vision International

David Daye



Silhouettes Slight underexposure shadows these three similar figures against the sunlit part of the street

Businessman With a telephoto lens, you can shoot intriguing moments like this without disturbing your subjects

Skyline You can make the most of an interesting skyline when the sun is at a low angle behind the subject

Balloons With a blackening sky, people hurry home; but one man holds a bunch of bright balloons aloft, instead of an umbrella. A well-spotted moment

Reflections As well as mundane subjects, look for interesting abstract photographs in the street

work can form the basis of an assignment which could give your photography a new lease of life.

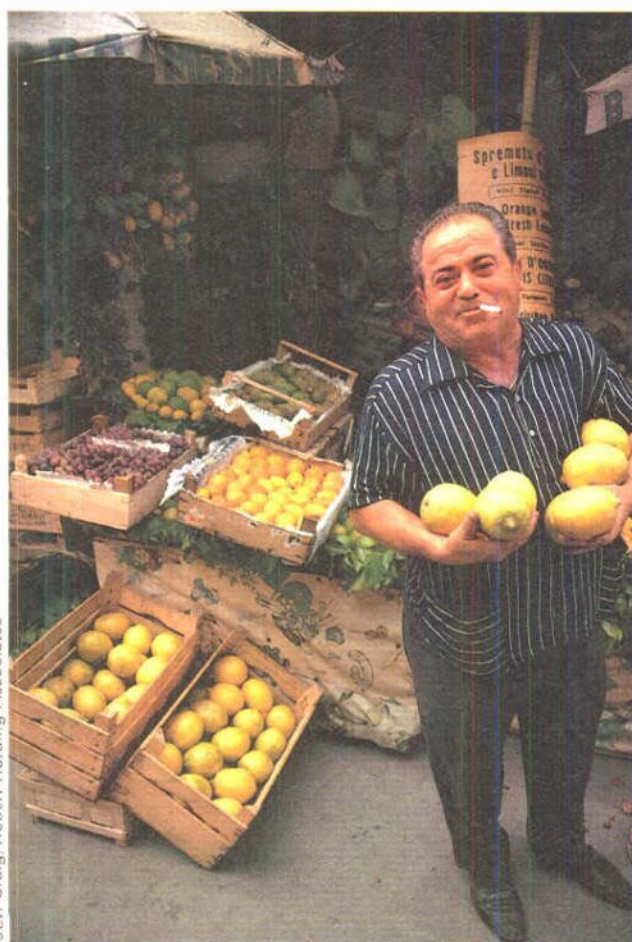
There are many ways in which it could be approached. You could, for instance, record the activities of a street throughout a day, or possibly contrast the life of a city street on a working day and at a weekend. Alternatively you could photograph the individuals who live and work in the street.

If you look at a book or collection of old photographs, you will find that the most interesting pictures are invariably of street life. This is largely because it is this aspect of our lives that most readily reflects the fashions, trends and life styles of a particular period. You could approach your subject in this way, trying to show how the way we live and the appearance of our environment is changing. In doing this you may well find that your pictures have an interest and appeal that goes beyond the purely visual aspects of their content. Even quite mundane features in an average street can have a quite significant effect on the nature of your photographs when considered in this way. Shop fronts, for example, have an identity of their own, and can make a series of photographs covering not just the old and picturesque, but also the new brash fluorescent displays. Advertising signs, lamp-posts, post boxes, and even manhole covers are important features of the street which go largely unnoticed. All these can become effective elements of a composition when





Parade A street parade usually brings colour and activity to an otherwise dull scene, so have your camera ready. A high viewpoint makes the shot more interesting



Fresh lemons Make the most of a subject who is happy to take part in your picture. Here the sharp yellow of the fruit contrasts well with the dark blue of the clothes



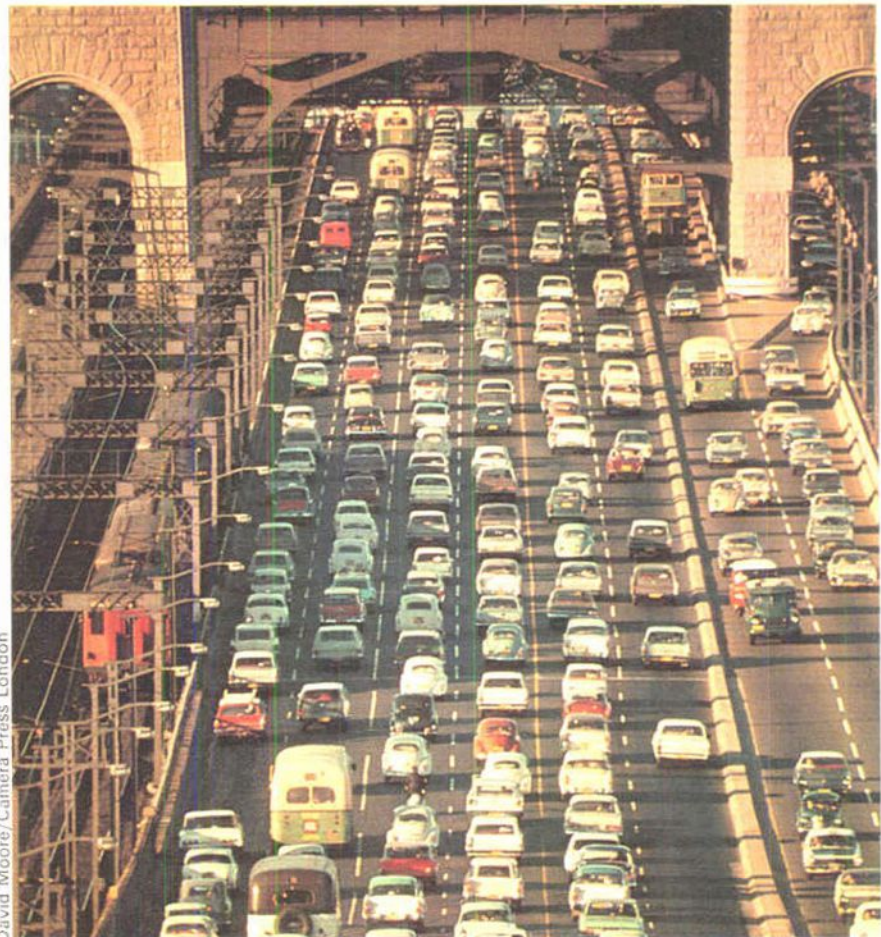
Homer Sykes

Walking the dog The dark figures are centrally placed, where they lead the eye down the length of the street

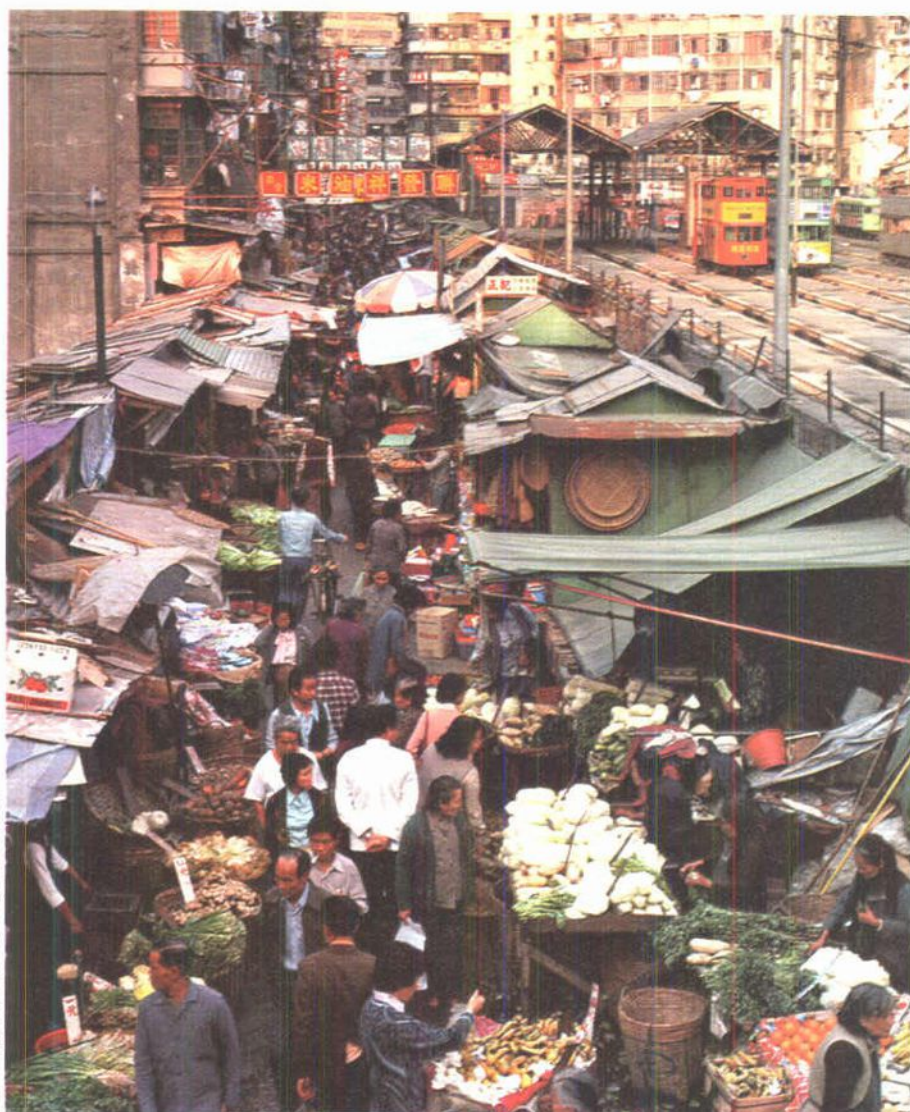
Sydney Bridge From a high viewpoint a telephoto lens further exaggerates these packed lines of traffic



Rickshaw A cleverly spotted candid moment. The contrasting shapes and colours add to the success of the shot



David Moore/Camera Press London



Street market A viewpoint from just above the scene is ideal for showing up the patterns made by people as they thread their way past the stalls

Having a laugh Asking people to play up to the camera does not always work, but it certainly is most successful here as these porters relax for a moment

Water fountain Look for colourful subjects to give interest to an otherwise dull street scene. Here the blue swimsuit livens up a grey photo



Tapdance

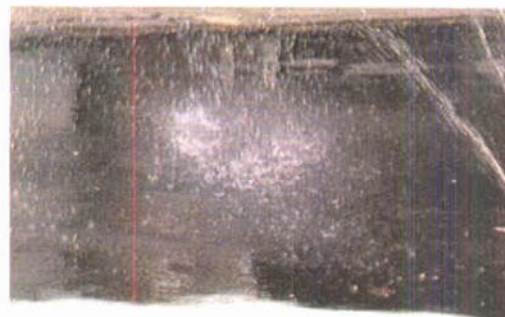
approached in a perceptive way.

A street is also full of movement and can be an important element of your pictures. Cars, buses, horses, and bicycles are all subjects which have strong pictorial possibilities. The relationship between people and transport is also one which can be explored photographically. Jacques Tati produced a marvellous film sequence of candid observations of drivers in a Parisian traffic jam, and a similar approach could provide the basis for a series of photographs at a pedestrian crossing or a traffic lights.

People waiting for buses, people riding bicycles, people walking and many other aspects of the street on the move provide some wonderful opportunities for candid photography, particularly for photographers who like to inject a little humour into their pictures. Look at the parking meters, traffic wardens, or policemen on traffic duty. There is an almost irresistible appeal in these subjects for a humorous approach and as anyone who likes to shoot unobserved will know, a subject who is preoccupied is easy prey to a photographer with a keen eye and a quick response.

In the same vein, a street market can be a treasure house of human interest pictures. Market people are invariably extrovert and often have the type of faces and mannerisms which can make great pictures. The intense activity of the shoppers can also provide some fascinating expressions. As with all candid picture situations, the best opportunities occur if you allow time to become absorbed into the environment. Let your potential subjects become accustomed to your presence before you attempt to take any pictures. And be as discreet as possible—change film and lenses in a quiet corner or doorway.

One of the problems that often occurs when shooting in street markets is a fussy and confusing background. Consequently, it is vital to choose camera positions carefully so that your subject is clearly isolated from the surroundings.



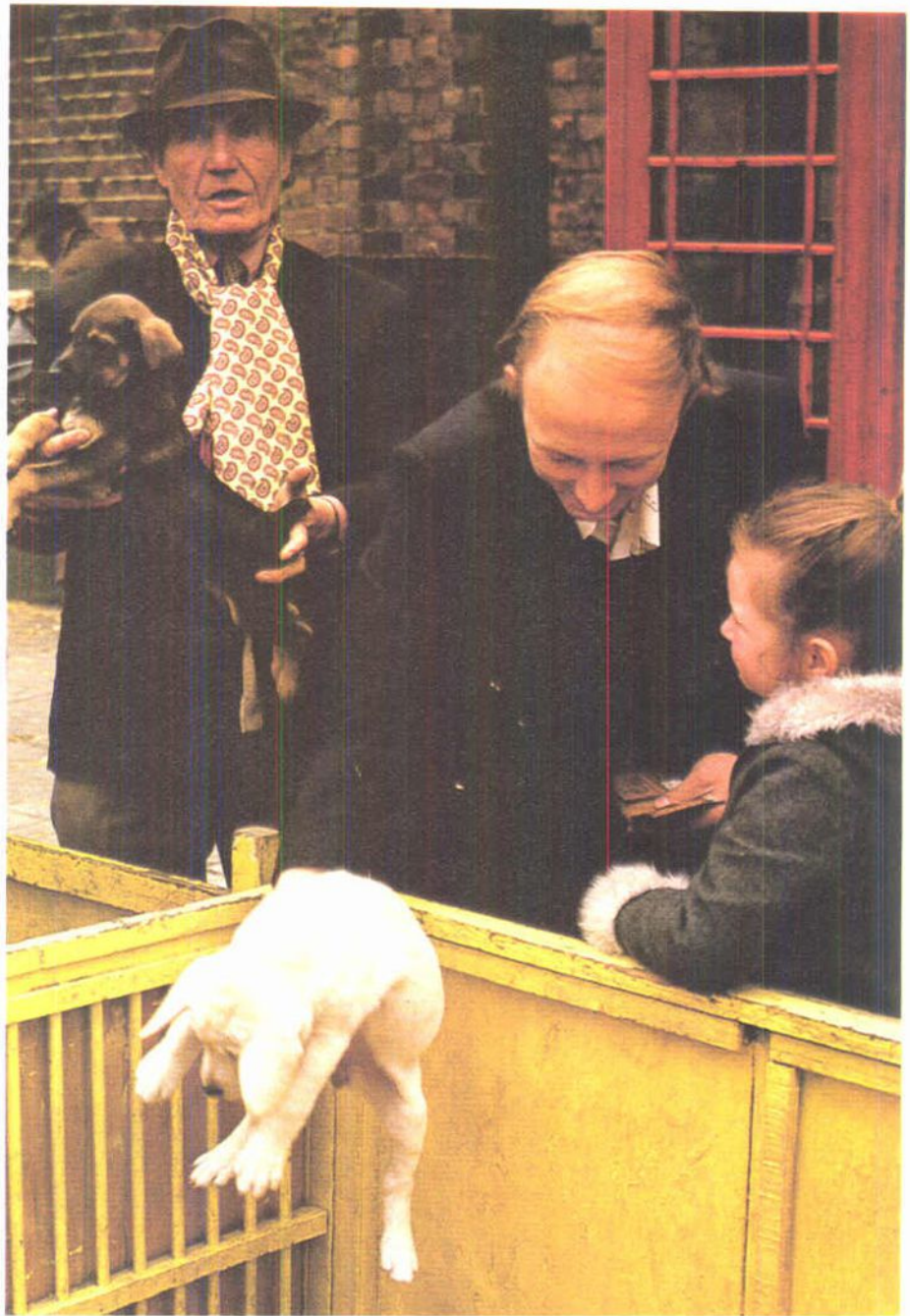
George Wright

It can help to use a telephoto lens to frame your pictures tightly—if you use a fairly wide aperture even the most distracting background details can be kept well out of focus.

Lighting contrast can also be a problem in a market, particularly on a sunny day when shadows are cast from surrounding buildings and the awnings of market stalls. Even on a cloudy day the subject contrast can be appreciably higher than in a more open space. Careful choice of viewpoint is again the most effective solution to this problem. Try to frame your picture so that it is predominantly either in the sunlight or in the shade, and expose accordingly.

To a large extent you are less dependent on the quality of the light when shooting pictures in an open, small village street out in the country, since the inherently colourful and graphic nature of your subject is less reliant on the effect of the light. For this reason the street makes a good subject on a day when the sky is overcast and the lighting is rather flat. This is particularly true when shooting colour pictures. The bright colours to be found in markets are often more saturated when photographed under this type of light. A sunny day is, however, by no means unsuitable as long as you avoid subjects with an excessive contrast range.

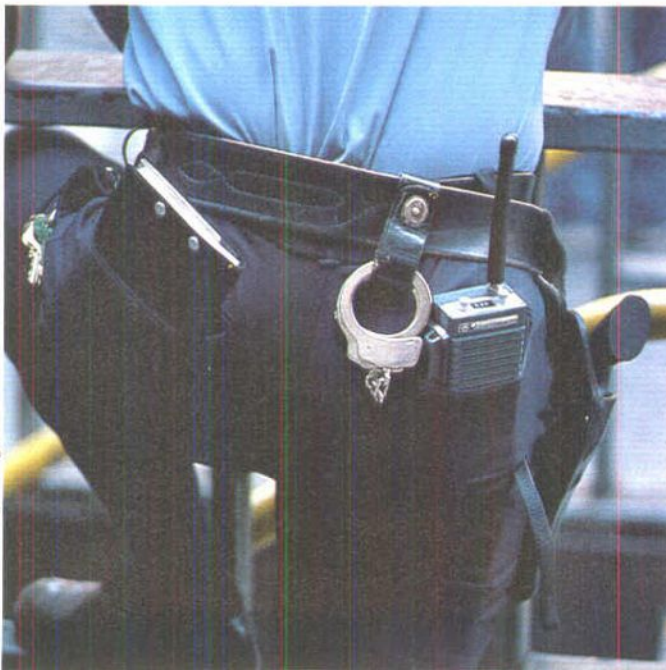
Street photography does not have to be confined to daylight hours, since the lighting provided by street lights and shop windows can also create interesting and effective pictures. It is usually preferable to take such pictures before it is completely dark, particularly when a large area of the scene is included in the frame. The small amount of daylight present will act as a fill-in light for the artificial light, preventing the subject contrast from becoming too great, and revealing detail in areas where the street lighting does not reach. A fast film of 400 ASA (ISO), or faster, will make hand-held exposures possible under most circumstances. You can use slower film with a slow shutter speed as long as you use a tripod or brace the camera.



Tapdance



George Wright



Buying a puppy

Watch for those odd moments at street markets. Here it seems that the man, having checked his wallet, is refusing the puppy, despite his little girl's disappointment

Ready for trouble

This photograph has been cropped in order to eliminate other distractions from the street, and to show clearly all the equipment used by the officer

Commercial processing

Professional laboratories can process and print your films to a generally higher standard than that offered by cheaper commercial processing organizations and also provide a much wider range of services



Unless you have your own processing equipment and darkroom, every film you shoot must be sent away for commercial processing. Most photographers are content to use the D & P (developing and printing) laboratories. Because of the sheer volume of work they handle—many handle over 10,000 prints a day—these labs can keep their prices very low. But they can never give the individual attention that high quality photographic labs can give.

For the kind of care and expertise that you need for first class prints in particular, you must usually go to one of the specialist professional labs. Many of these labs do not advertise in the amateur photographic magazines, but you can find them in a classified telephone directory or from advertisements in the trade press. These places may be a little more expensive, but for certain processes, the extra expense may be justified.

Negative processing

For colour negative processing, the expensive laboratories use exactly the same process as any other lab, the Kodak C41 process. A few labs use film loaded individually into reels and batch processing rather than machines that feed film through in a continuous strand, but there is little advantage in this—indeed it can be a disadvantage because it can lead to inconsistency.

Yellow coat When a print is dominated by one colour, enprints usually give poor results. A hand print (left) gives much stronger, more vibrant, colours

The difference between the cheap and expensive labs normally lies in the sophistication of fault detection systems. Some of the most modern processing machines include infrared detectors and other clever devices to tell immediately there is a fault. It is not usually worth spending any extra on processing unless you know for certain that the lab has the latest electronically monitored machines.

Slide processing

Although your choice of laboratory is not particularly important for colour negatives, it can make a considerable difference with slide film. You can only send film such as Kodachrome or Agfa CT back to the manufacturers for processing, but Ektachrome, Fuji, Sakura, 3M, Agfachrome, Barfen and other films can all be handled by independent labs.

The process generally used in the professional labs—the Kodak E6 process—is the same as that used in laboratories which cater for the amateur. Professional labs, though, use small scale batch processing which can potentially produce better transparencies. D & P labs on the other hand, use automatic threaded

machines that not only feed film through in a continuous strand but even cut and mount slides. Automatic cutting and mounting can often make long tramline scratches on the film. If you do use a D & P lab, you can avoid tramlines by specifying that your films should be processed uncut and unrolled.

Professional processing may also be by machine but, if it is, films are usually loaded and unloaded by hand. Professional labs do not normally mount slides, but if you ask for mounted slides, they will be mounted individually by hand. Films are therefore less likely to be scratched—although, despite cotton gloves, they may pick up a few finger marks. As well as better quality processing and careful handling, professional laboratories cater for push processing of film, at extra cost. This allows you to rescue films that have been underexposed, or gain that extra film speed to shoot in low light.

One other big advantage with the professional laboratories is the facility to process a small piece of film cut from the end of the roll to test for colour and ASA rating. They can then give special individual processing for the rest of the film to ensure high quality. This is called *clip testing* and is usually only done with slide film. The disadvantage is that you lose a few frames at the beginning of one film, but you can take this into account when shooting the pictures.

Prints from negatives

Nearly all prints made from negatives, whether in D & P labs or professional labs, are made on semi-automatic machines. These machines range from a small desk with little more than an enlarger with a colour head to video consoles that analyse the negative, show the operator a positive version on a TV screen and have a range of many different enlargements.

The big D & P labs tend to use large machines that balance the colour automatically. This works well for most negatives, but if the picture has a large area of one colour, the automatic colour correction system can be fooled. If you photograph a person against yellow sand, for instance, the machine will try to compensate for the apparent yellowness and give the print an overall blue cast. Against a deep blue sky, on the other hand, skin tones can come out orange. Every lab employs 'graders' to spot any unnatural casts, but in the cheaper labs, only the very worst prints are sent back for reprinting.

Processing and printing *Because labs that cater for the professional have a lower workload, they are able to give films more individual attention than the developing and enprinting companies that usually process amateurs' films*

Professional labs often have similar machines, but instead of going straight to the full print, they usually make a thin diagonal test strip. If the full print still needs correction, a second full print is made.

Most professional labs offer two different machine print services: social and commercial. The 'social' service is generally cheaper and is intended for weddings and portraits: the grader looks for a few common colours such as black suits, skin tones and white dresses and simply aims to produce these correctly. This usually gives good results and few have to be printed twice, this helps to keep costs down. The 'commercial' service, on the other hand, is more expensive but allows the closer attention to the colour balance that is needed for studio advertising shots, and industrial and scientific photographs.

Nearly all the professional labs also print by hand if requested, as do many D & P labs. In the D & P labs, though, a 'hand print' tends to mean simply a print not made on the machine. Usually only one test is made and the print size is fixed: the operator only adjusts the enlargement setting if you specifically select a part of the negative to be blown up. With professional hand printing, however, the print can be exactly

matched to any colour sample supplied: it can be made to precise scale: small areas can be lightened or darkened or even changed in colour: and dust spots and scratches can be retouched. Unfortunately, professional hand prints are very expensive.

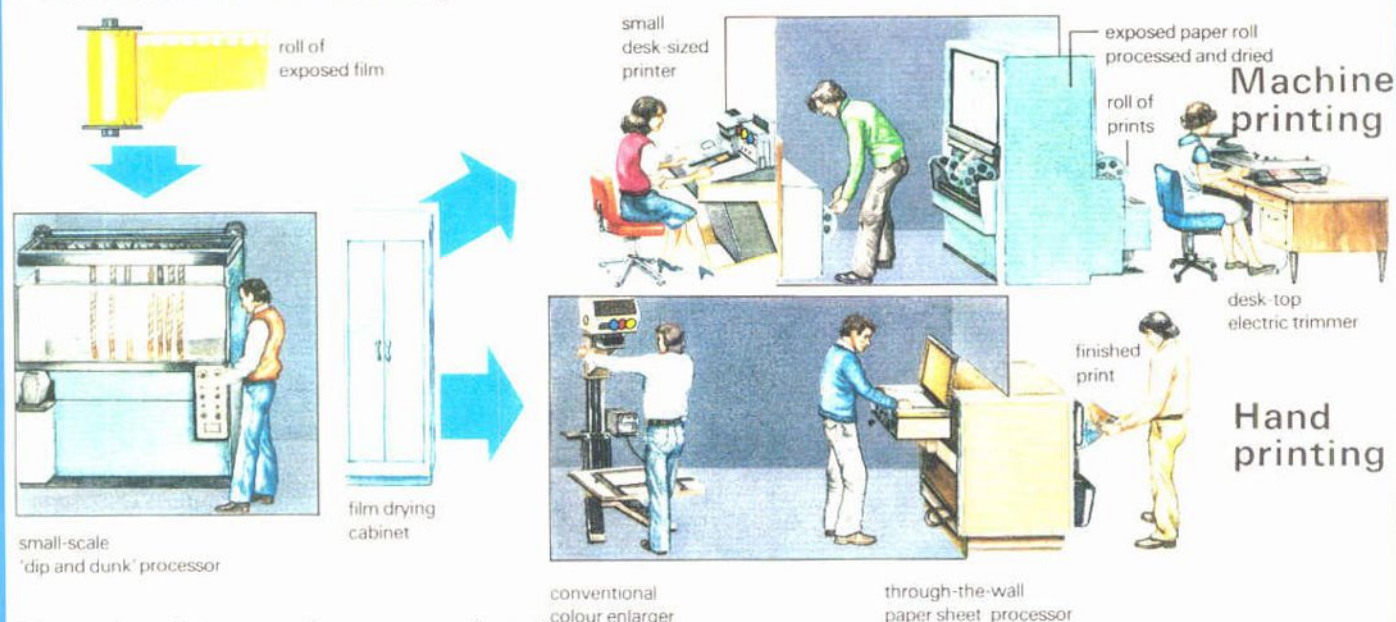
Package deals

If you are dissatisfied by the quality of the enprints from your local lab, but you do not feel you can justify the expense of having all of your photographs printed at professional print prices, then you may be able to take advantage of package deals that include developing and printing a complete roll of film. These package deals are less expensive than individually printed frames, but only work well when the whole roll has been exposed under similar conditions.

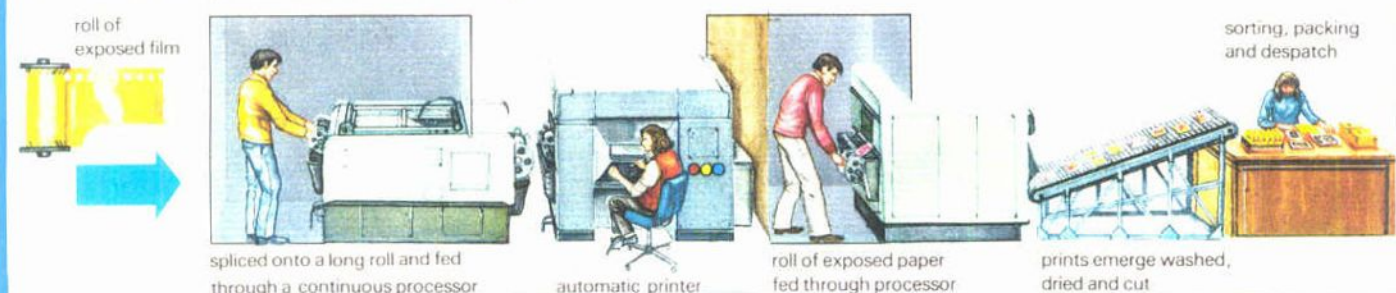
Unfortunately, most professional labs usually expect prints to be at least 17 x 13 cm for package deals, and if you ask for anything smaller, they may simply pass the film on to one of the large D & P labs.

Wherever you have your prints made, they cost more if they are reprints—prints not ordered at the time of film processing. Because the D & P labs are not geared to this type of work, they may charge up to 50% more for reprints than for prints returned with the film. The

Professional laboratory



Developing and processing laboratory



Enprints, machine prints and hand prints



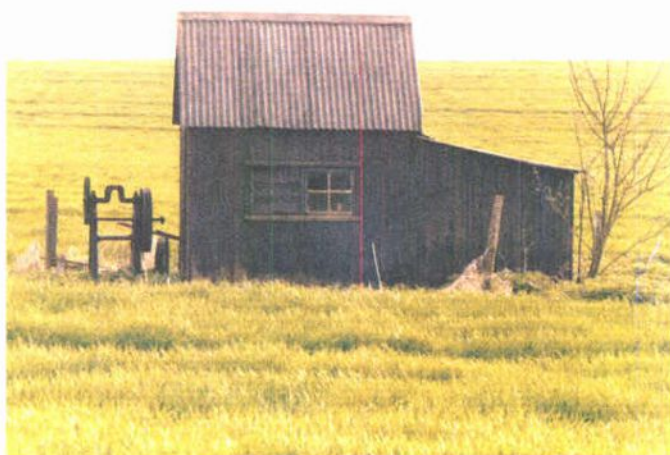
Enprint



Machine print



Enprint



Machine print



Enprint



Machine print



Hand print

Market awning

The enprint of this picture shows the correct exposure for the display of food under the awning, but the area outside is overexposed. The machine print is a fairly good compromise, but best results are produced by the hand print, which retains detail both outside and under the market awning



Hand print

Shed in field

The machine used to make the enprint has overcompensated for the pale green grass, with the result that most of the detail in the dark shed is lost. A professional machine print is slightly better, giving more shadow detail, but a costly hand print keeps detail in the shed, and also puts some tone into the sky



Hand print

Flash outdoors

Flash pictures are extremely difficult for an enprint machine to cope with. This one has a pale figure against an underexposed background. A machine print gives a darker figure, but only a hand print can cope with the wide tonal range, keeping detail in both shirt and dark background

extra cost of reprints is not nearly as great at the professional labs which handle more of this kind of work.

Prints from slides

Commercial prints from slides are almost invariably made by hand and are accordingly expensive—the only exceptions are the cheap enprints at D & P labs. They can be made either direct from the slide, using similar methods to those shown on pages 621 to 625, or they can be made from an *internegative*. An internegative is a high quality negative made from the slide on special film. A print can be made from this negative in just the same way as from any other.

For prints up to 20 × 25 cm, the negative is usually made on a 120 roll film or on special 46 mm copy film. For large, high quality prints, the negative may be made on 10 × 12.5 cm sheet film although this can be very expensive. Internegatives can be made on 35 mm film, but results tend to be much less satisfactory.

Although the internegative is generally more expensive, it has two main advantages. First, it is actually cheaper when you want to make a large number of prints from a single slide. Second, a good internegative can usually give better quality results than a print direct from the slide.

Choosing your lab

For processing colour negative film and the first set of enprints, D & P labs normally give good results and it is rarely worth paying extra for professional processing unless you make it part of a package deal. However, for enlargements of your best photographs, the professional machine prints are generally better than anything the D & P labs can produce and may even be cheaper. But unless you want special corrections, or have a subject like a sunset which is hard to machine print, a hand print tends to be an unnecessary extravagance.

Slide films, on the other hand, benefit from careful treatment and it is worth paying a little extra, especially for important films, to take them to a professional lab. Wherever you send slide films, though, mount the slides yourself to avoid any danger of scratches.

A point to bear in mind is that some professional labs do not like processing for amateurs. They may make a surcharge for films other than Kodak and may charge extra for anything other than Vericolor II. They also prefer to handle film larger than 35 mm and give their best results with large format negatives.

Before sending film to any professional lab, check on their willingness to handle your work and ask for a full price list (including details of postage and packing and taxes). Avoid sending film abroad unless securely packed, preferably in a film shield bag for some protection against X-ray machines. Mark all films clearly with the process and type of service you want.

Autofocus cameras

Automatic focusing, a further step towards user convenience, has been made possible by three different systems of measuring subject to camera distances automatically

Only a few years ago, many photographs taken with simple cameras displayed two common faults—poor focus and incorrect exposure. But while exposure problems have largely been overcome, even on cheaper cameras, by way of automatic exposure control, problems arising from incorrect focusing have remained—until the advent of automatic focusing.

Automatic focusing on cameras is achieved in a variety of ways depending on the system used to measure the camera-to-subject distance. Such systems are described as *active* or *passive* and differ in a number of ways.

Active systems

Active systems work by sending out a pulse of sound or light—this distinguishes them from passive systems, which emit no such signal.

The simplest of the active autofocus systems is that used by Polaroid on their Sonar cameras. These have a small module above the lens which contains, among other things, a gold-plated disc mounted behind a perforated plate. This disc is actually an ultra-

sonic transducer. To activate the automatic focusing system, the shutter release is partially depressed causing the transducer to emit a 'chirp' of ultrasound. This is a very high pitched squeak, too high to be heard by the human ear and is much like the sound 'radar' that bats use to detect objects in their flightpath. At the same moment, a quartz clock is started and the camera begins to measure how long the echo of its ultrasonic chirp takes to return from the subject.

If the subject of the picture is a long distance from the camera, like a landscape for example, the echo will take a long time to return or else there will be no echo at all. In such cases, the lens of the camera remains at rest, focused on infinity.

If the echo returns quickly, though, the timing circuit in the camera measures the delay and, from the reference point of the speed of sound, calculates the distance of the

Centre the subject A few autofocus cameras demand a central subject. They would be 'fooled' by this scene



Victor Watts



Michael Newton/Cameras courtesy Canon & Konica

Automatic focus Cameras use different systems to focus the picture—ultrasound, infrared and subject contrast

subject. A tiny electric motor then winds the lens out, away from the film. Once the lens has been wound out far enough to focus the image, the camera's computer 'brain' stops the motor, and the camera is ready to take a picture. Further pressure on the shutter release opens the shutter, and makes the exposure.

This system has the advantage that it can be used in total darkness, and the lens can be focused and refocused as many times as necessary before the photographer takes the picture, in much the same way as an ordinary camera. On the other hand, the system is not foolproof. A subject on the far side of a window, for example, will cause problems for the camera. The sound echo will bounce back from the glass rather than from the subject behind it and, therefore, focus will be incorrect.

Another active system, which is used on Canon cameras, uses a beam of infrared light to measure the distance to the subject. Similar to an ordinary optical rangefinder (see page 614), this system has two small windows which scan the subject. Behind one window is an infrared light source, and behind the other, a photocell which responds only to infrared light.

The infrared light source is pivoted and mechanically linked to the lens. The system is set up ready for operation by first winding on the film. As this is done, the lens is racked out from the camera, so that it is focused on very close objects. The infrared lamp initially points inwards. Then the camera is aimed and the shutter release pressed, but the exposure is not made instantaneously. Instead, the lens begins to move in towards the camera under spring pressure. Because it is linked to the lens, the pivoting infrared source also moves, emitting light in the process as it begins to swing out to scan the subject.

At some point in the arc through which the light source swings, the beam of infrared light hits the subject. The photocell detects the reflected light, causing the electrical current flowing from it to reach a peak. The 'pulse' of electricity stops the movement of the lens and releases the shutter.

If the subject is close to the camera, the infrared beam will not have to swing very far before coming to rest, but if the subject is at infinity, the beam will swing right out before the exposure is made. At this point, the lens will have moved a long way back towards the film, before stopping and so the camera is focused on infinity.

Because it is an active system, the infrared focusing method shares some of the

advantages of the Sonar method. It can be used in total darkness, and is not confused by low contrast or plain subjects. It does have problems with sources of infrared light, though, and if the sun is just behind the subject of the picture, incorrect focusing may result.

This system can also be fooled by highly reflective surfaces. For example, an infrared light beam will bounce off a wet car bonnet at an angle instead of reflecting directly back to the camera.

Since this system employs a spring to move the lens and the spring is set by winding on the film, there is only one opportunity for focusing. If you get it wrong, there is no second chance, and the shutter is released anyway.

Passive systems

Passive focusing systems do not work on the principle of sound or light emission, instead they scan the subject optically. The basis of passive systems is the Honeywell Visatronic system, and this is used by a number of different camera manufacturers.

The system uses two range-finder windows, just like a conventional rangefinder camera. A single swinging mirror scans across the subject, and throws an image into one of the rangefinder windows. The other window 'sees' a fixed image of the subject. The two image reflections are projected on to light sensitive cells within the rangefinder module, and this tries to match them up. When the image from each window is identical, the system registers a peak in electrical current—the outputs from the two light sensitive cells reinforce each other.

A circuit in the camera detects this peak, and moves the lens to a point that results in the sharpest focus.

The electronic circuitry recognizes when the images are perfectly superimposed by recognizing the increase in contrast and this system of automatic focusing is called **contrast recognition**. This works because when the two images are slightly apart, contrast is low since shadows and highlights overlap, reducing their intensity. They only achieve their full value when they coincide.

Like other systems, contrast recognition has its limitations. It will not work in low light conditions, and can easily be misled by high contrast objects in front of the subject. For example, an animal in a cage might be incorrectly focused if the bars of the cage are quite close together. The animal presents the camera with a low contrast target, whereas the cage bars are quite high in contrast, so the camera

focuses on the bars rather than the animal. This system will, however, focus through a window.

Other systems

At present there is no commercially available system for automatic through the lens focusing, though there is at least one prototype.

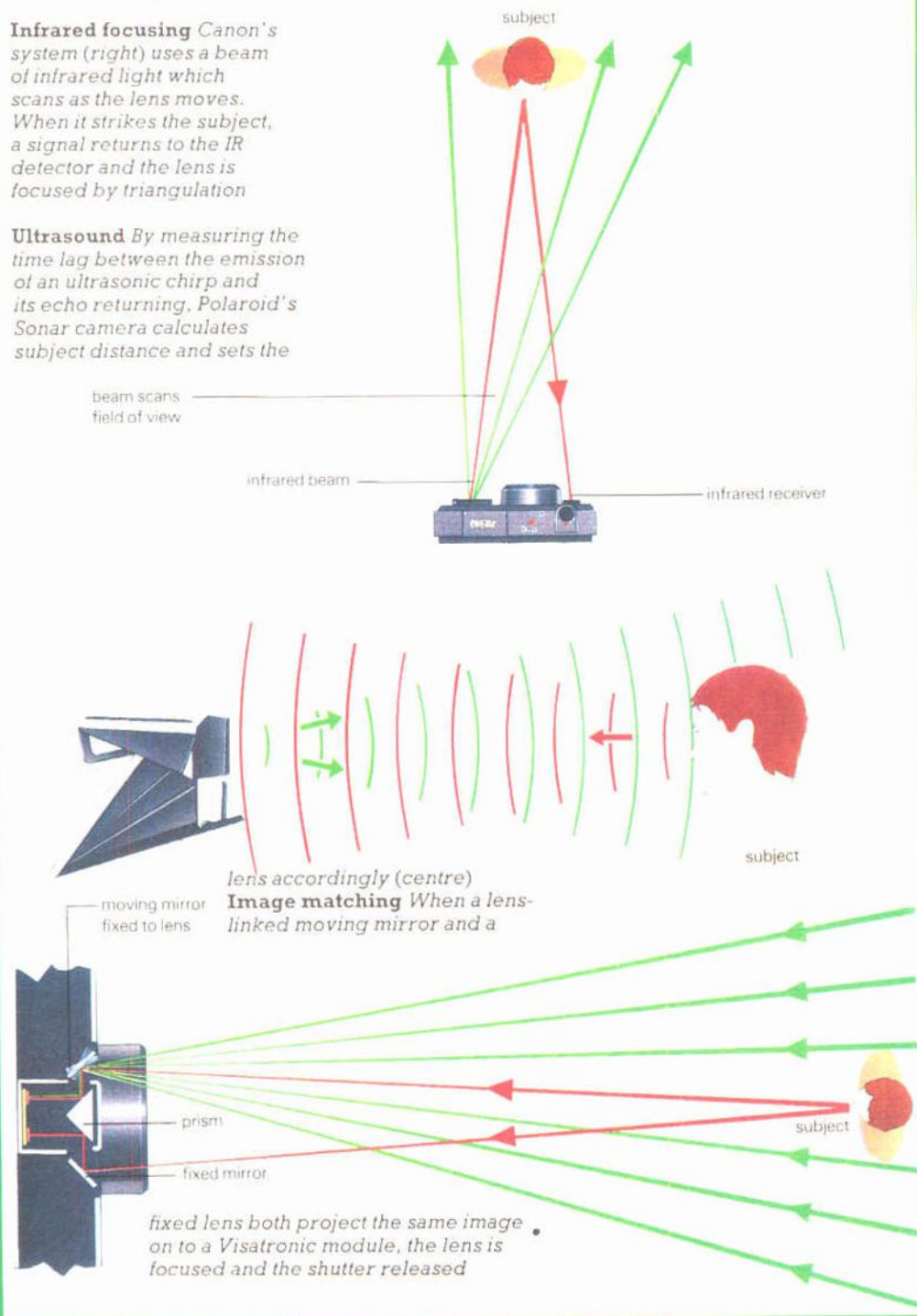
This is operated by using two photoelectric cells, one fitted slightly below the focusing screen, and one

above it. These measure the light intensity of the image coming through the lens. When the image is in focus, the light falling on each of the cells is equal, but when the image is out of focus, one photocell is more brightly illuminated than the other. By comparing the current from each photocell, the point of sharp focus can be recognised. This is actually a variation of the contrast recognition system.

How autofocus works

Infrared focusing Canon's system (right) uses a beam of infrared light which scans as the lens moves. When it strikes the subject, a signal returns to the IR detector and the lens is focused by triangulation

Ultrasound By measuring the time lag between the emission of an ultrasonic chirp and its echo returning, Polaroid's Sonar camera calculates subject distance and sets the



High speed photography

Highly specialized cameras for high speed photography have opened the door to new areas of scientific study, and microscopically small subjects and movements can be examined in greater detail than ever

Dr Harold Edgerton/Science Photo Library



Bullet in flight Harold Edgerton used his stroboscope to light this bullet passing through a playing card. Exposure was less than $1/1,000,000$ sec

Blast The fireball of an atomic bomb was caught automatically with a magneto-optic shutter. Edgerton used a 305 cm lens from 11 km away

Muybridge used shutter speeds of up to $1/1000$ second to take his pictures—a speed which has only recently become common on cameras—but they were often indistinct because even in California Muybridge could not provide enough light for the insensitive emulsions of the time. Indeed, lack of light remains a problem in high speed photography to this day, despite the much greater speed of modern films. The most successful means of overcoming this was first used by one of the fathers of the art of photography, Henry William Fox Talbot.

At that time slow shutters and insensitive lenses and emulsions made the photography of even slow movements impossible. In order to solve this problem Talbot invented 'spark' photography. The spark he used was an electrical flash produced by the discharge from a battery of Leyden jars. These act as a capacitor, or electrical storage reservoir (also called a condenser). Talbot produced electricity, using an electrostatic machine, and stored it in the Leyden jars until enough had built up to produce a very bright spark.

Talbot's most successful experiment was to photograph a page of the *London Times* which he had attached to a rapidly rotating disc. The camera was focused on the disc with the shutter left open. The bright flash was about $1/100,000$ second and froze the movement of the spinning disc.

Talbot's success was not followed up

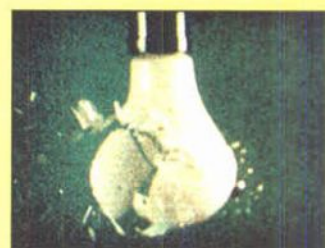
Ever since the invention of photography people have been attempting to capture movement on film. Almost any camera can capture a movement that takes place quicker than the eye can see—photographs of people walking, with their gait frozen in odd positions, are an obvious example. But take this procedure to its limit, with pictures taken in the briefest fraction of a second, and the results are both dramatic and scientifically valuable.

Nowadays high speed cameras can be used to help study and analyze anything which moves too quickly for the human eye to follow. They are used in industry to study the workings of fast moving machines or to reveal how plastics and metals are affected by weather conditions. In medicine they may be used to study the operation of heart valves or the flow of blood. In government research they are used to study atomic explosions and the effects of pollution, and they are used to study all types of motion.

Although today's ultra-fast high speed cameras are essentially movie cameras, some of the most important early work in discovering the nature of movement was made with still cameras. The most spectacular of the late 19th century experiments were the studies of movement in humans and animals made by Eadweard Muybridge in the 1870s and 1880s.

Muybridge was a British photographer living in the United States. Leland Stanford, a former governor of California, asked his help to test out a wager he had made about whether or not a trotting horse ever has all four of its hooves off the ground at the same time. Muybridge used a set of 24 cameras, each triggered off by a trip wire as the horse trotted along, and proved conclusively that the horse was indeed airborne at some point. After the success of this experiment Muybridge went on to make further studies of movement.

Breaking glass A series of frames from a high speed film taken at 5000 frames a second. This was taken on a rotating prism NAC camera of the kind used by many scientists for research purposes. This type of camera can take up to 8000 frames per second



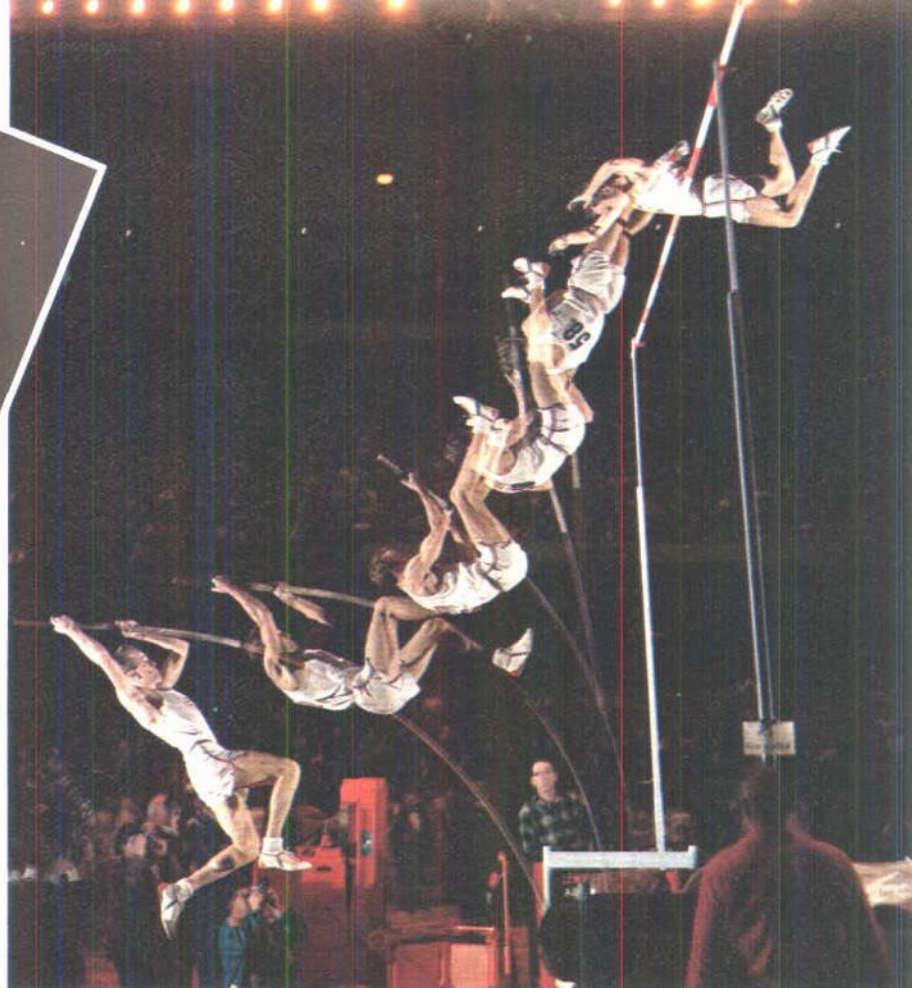


until 1881 when Ernst Mach (who gave his name to the term describing the speed of sound) perfected spark photography to take photographs of a bullet leaving the muzzle of a gun. The flight of the bullet triggered off the spark which cast the bullet's shadow on a photographic plate and left a clear silhouette. This showed not only the bullet but the shadows of the sound waves moving outwards from the bullet.

The principle of building up a powerful electrical charge to produce a flash is the basic idea behind most modern high speed photography but it was not put into widespread practice until the 1930s. It was then that Harold Edgerton, a young graduate student in electrical engineering at the Massachusetts Institute of Technology (MIT), made a major breakthrough in the development of high speed photography by inventing the 'strobe'.

Viewed in retrospect, his breakthrough was simplicity itself. He took the naked electric spark used by Talbot, Mach and others and put it inside a lamp or tube filled with a gas—usually argon, krypton or xenon. The result was an extremely bright, brief and controllable flash of light. Many times brighter than sunlight, the Edgerton strobe has an intensity equivalent to nearly 40,000 domestic 60 watt lightbulbs, but its duration is so brief that an onlooker would be unaware of its brilliance.

The electricity is accumulated in a capacitor until it reaches a critical threshold and is suddenly discharged



Pole vaulter Edgerton's multi-flash picture of David Tork in Boston Garden, New York, is one of a series of pictures of athletes he took over the years

into the gas. By using capacitors that accumulate and release electricity very rapidly, Edgerton was able to produce repeated high intensity flashes at very short, exactly determined intervals. He called this pulsing flash lamp a *stroboscope*. 'Strobe' has become the word used for the whole family of fast flashing electronic lights, whether they give repeated flashes or only one.

Edgerton's strobe, by producing a flash that was both extremely brilliant and extremely brief, solved two of the major problems of high-speed photography. It reduced the duration of the exposure and provided sufficient light for the film to be adequately exposed in spite of this brief exposure.

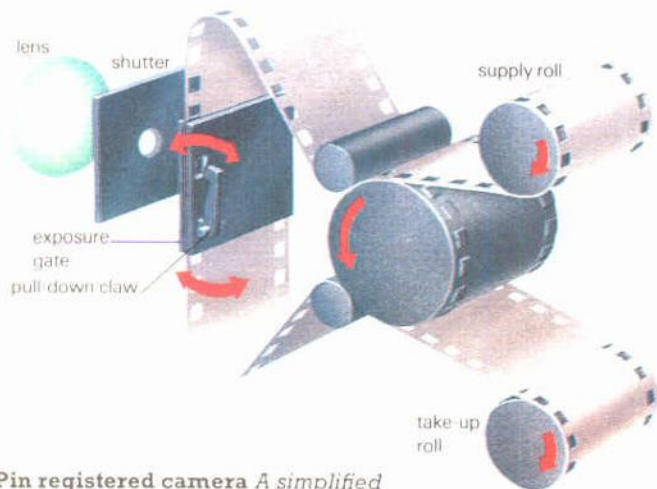
High speed photography generally involves exposures of less than $1/10,000$ of a second—compared with those of an ordinary still camera where the usual minimum exposure is $1/1000$ of a second. The development of Edgerton's

strobe made these speeds possible using only an ordinary camera and film. The only special equipment needed was the strobe light.

Throughout the 1930s Edgerton used his new technique to explore the new world that had been opened up for study. His strobes acted as a kind of microscope of time. Just as ordinary microscopes magnify matter so that the invisibly small is made large, so the electric strobe, and the high speed cameras developed later, magnify invisibly brief or rapid events so that they are slowed down or 'frozen' for observation.

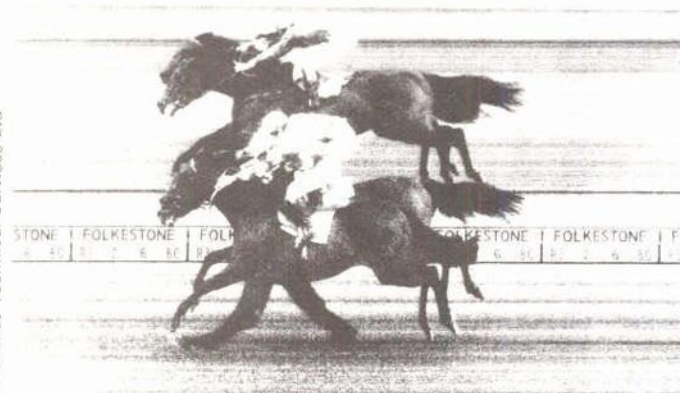
Before the advent of effective high speed photography, little was known about ultra-fast events. Edgerton conducted a large number of photographic investigations to find out just what happens when objects move at high speed. By revealing that a bullet is already more than a metre from the





Pin registered camera A simplified diagram of a camera which uses a very sophisticated shutter mechanism and a pull down claw to help advance the film extremely quickly

Racecourse Technical Services Ltd

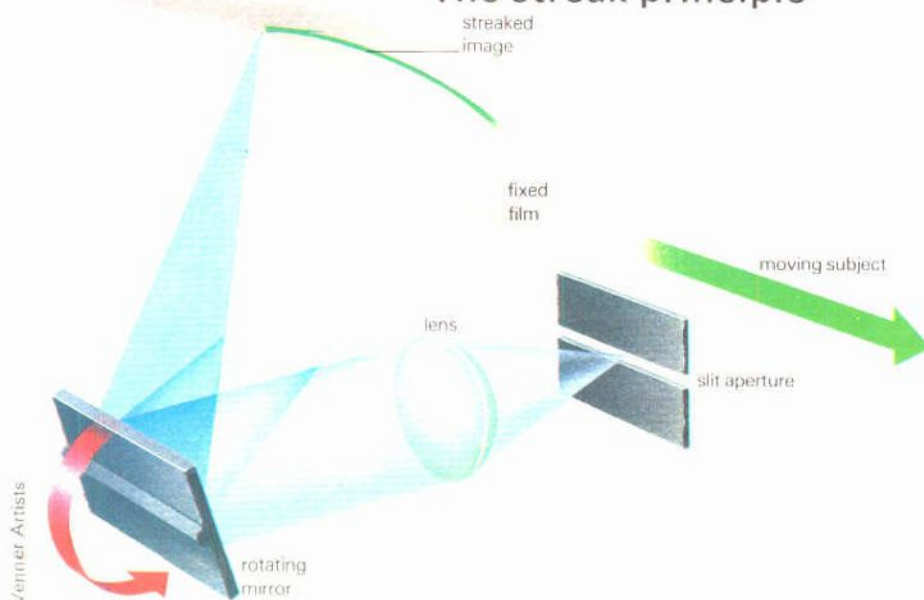


The finishing post Strip images from streak cameras clearly show the winners at race finishing lines

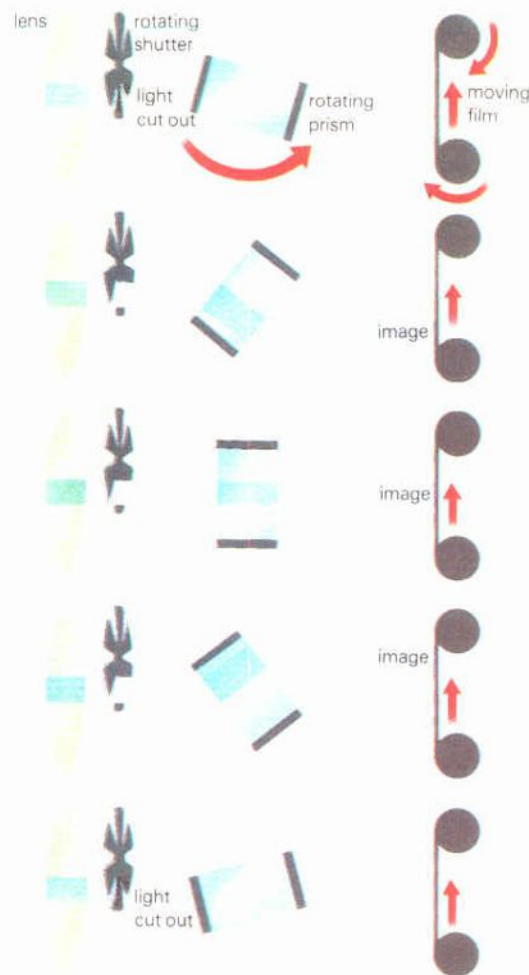
muzzle before a pistol kicks back, he showed that this kick could not affect the accuracy of the shot. He also showed that a bullet did not, as was assumed, accelerate for some time after leaving a gun but achieved its maximum velocity just a few centimetres from the muzzle.

In other fields, too, Edgerton challenged some widely held assumptions. He began to analyze not only the movement of objects, but also the movements of sportsmen. A stream of prominent sports personalities visited Edgerton's laboratory for an analysis of their

The streak principle



Venier Artists



Rotating prism principle Some high speed cameras use a prism which alternately blocks and passes light

techniques. Professional golfers, for example, had been trained to believe that the follow-through of their stroke was all-important. Edgerton's multiple exposure 'strobe' pictures showed them that the time of contact between a golf club and ball was a mere six thousandths of a second and that the distance they travelled together was a mere 0.84 mm. Their belief that the club could be used to direct the ball on the follow-through was thus confounded by the evidence of the high speed photographs.

In order to ensure that his strobe flashed at exactly the moment the ball hit the golf club, or tennis racket, or even more vital, at the moment a bullet left a gun or pierced an object, Edgerton devised a number of solutions. A bullet travels at speeds of up to 1,220 metres per second—4350 km/h—and exposures as brief as one millionth of a second were needed.

Sometimes Edgerton attached a simple electrical contact to the object being photographed. In other cases he used a microphone to set the light flashing, or a photoelectric cell that monitored the

Rotating mirror camera The mirror is operated by a gas-driven turbine which 'wipes' the image across a short stationary strip of film

interruption of a continuous beam of light.

The many advances that Edgerton made in the development of this technique made his lab a mecca for all those interested in photographing rapid motion events. These included the famous *Life* photographers Gjon Mili and Crawford Greenewalt who in the 1950s took a stunning series of photographs of hummingbirds in flight.

A more recent exponent of this type of nature photography is the British photographer Stephen Dalton, whose pictures of tiny insects and birds on the wing are world famous.

The work of Edgerton and others allowed rapid events to be frozen by using an ultra-high speed sequence of flashes. More recently, commercially available power winders and motor drives which can produce 2½ to 10 frames a second brought rapid-fire sequences within the reach of a greater number of experimenters. However, the sequences produced were still too limited for the more complete analysis of movement that scientists required. For this photographers had to turn to motion picture cameras. These cameras operate on a time basis, so the photographer also has the opportunity of manipulating time.

A motion picture camera normally operates at 24 frames per second and the film is generally projected at the same rate. However if the rate of frames per second is altered in the camera, while keeping the projection rate steady, time can either be slowed down or speeded up. The first allows long periods of time

Green lacewing fly Three stages in the take-off of this fly were captured by Stephen Dalton using three consecutive flashes of up to 1/25,000 second

to be compressed into seconds—time-lapse photography. The second—high speed photography—allows tiny fractions of time to be expanded into seconds.

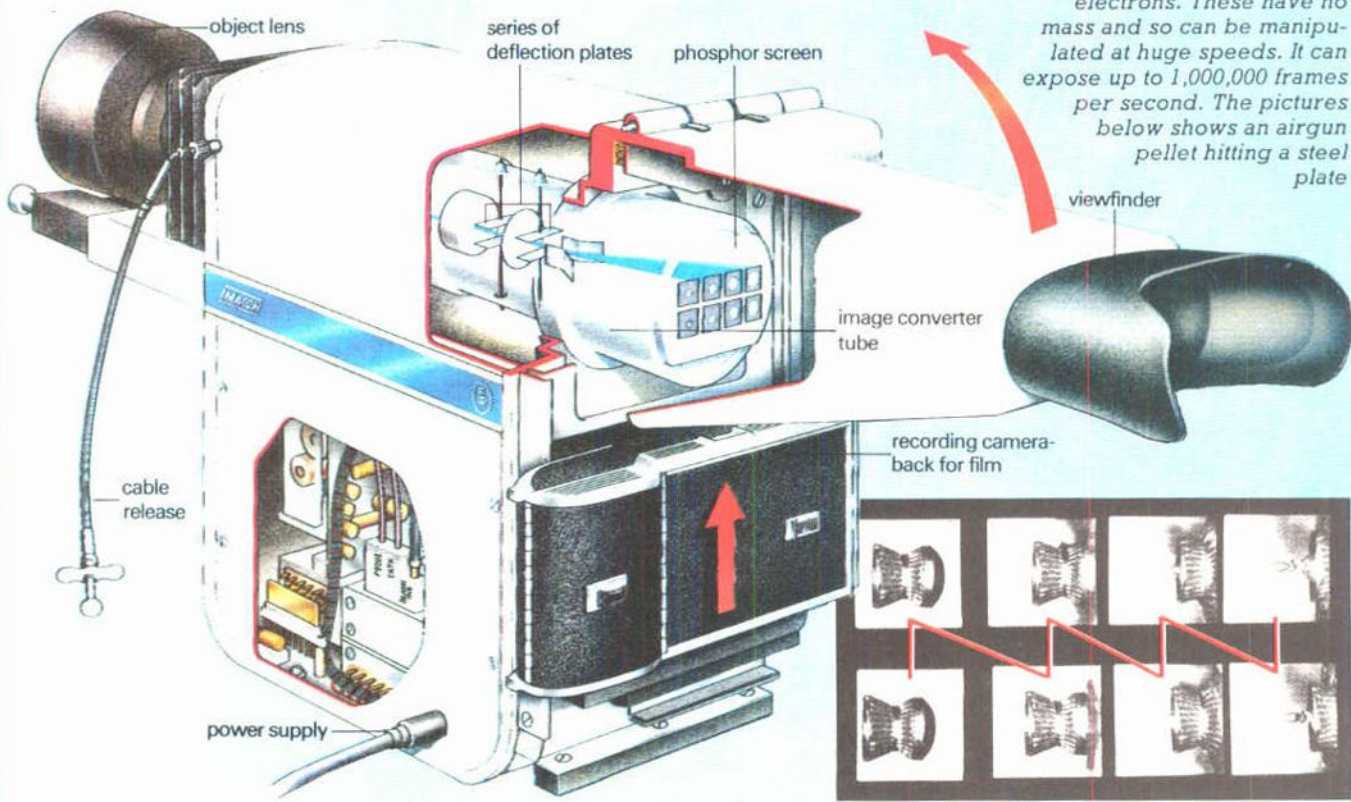
Ordinary motion picture cameras can operate at up to about 128 frames per second (fps), but true high speed photography begins at a rate of about 300 frames per second. The speed of operation needed will depend on the kind of analysis that the photographer wants to carry out. Specialized cameras are available that operate at over six hundred million frames per second.

Conventional movie cameras work by moving the film from one spool to another in a series of short sharp jerks. The film is momentarily halted at each frame and held in place by retractable

spikes known as 'register pins'. The most basic kind of high speed cameras work on the same principle. These are known as *intermittent action cameras*, but because of their complex mechanical nature they are limited to speeds of up to 500 fps.

Such cameras are available in 16 mm, 35 mm and 70 mm versions. They produce high quality images and, because the film is used at a slower rate, allow longer recording times, but their slow framing rate can make them unsuitable for photographing extremely rapid events. They can achieve shutter speeds of up to one hundred thousandth of a second, but the main disadvantage here is the movement which might occur in the space between frames.

The image converter camera



An image converter camera converts photons of light into electrons. These have no mass and so can be manipulated at huge speeds. It can expose up to 1,000,000 frames per second. The pictures below show an airgun pellet hitting a steel plate

Drum camera



Vener Artists

An alternative method of filming at higher speeds is the use of the *rotating prism camera*. This achieves a frame rate of up to 25,000 fps by using film that moves continuously through the camera. A rotating prism within the camera rotates at exactly the same rate as the film is moving, alternately transmitting and blocking the light that passes through the lens. The image in effect follows the frame of the film as it moves through the camera.

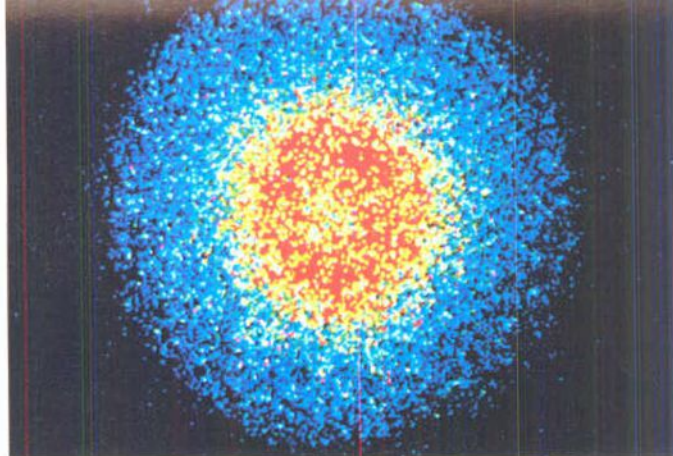
Although the fast rate of these cameras has led them to be used in ballistics and in industrial and other scientific research, the quality of the images is poorer and the cameras use up a lot of film.

These two types of camera are 'framing' cameras which record a series of sequential pictures or frames on the film. A third type of high speed camera is the *streak camera* which, instead of recording a series of individual pictures, records an uninterrupted image which is swept across the film by light entering through a slit. In a moving film camera the slit replaces the prism, but most of this type are high speed cameras which use a fixed length of film held stationary on a fixed track or rotating drum while the image is swept across it.

In a *rotating mirror camera*, the light entering the camera is caught on the spinning mirror driven by a gas turbine. In a *rotating drum camera* it is the drum on which the film is fixed that spins. These cameras are classified as ultra-

Drum camera
This simplified diagram shows how this camera works. The image is projected on to a rotating film

Ultra-high speed
Taken during one picosecond—this picture shows the thermonuclear implosion of a laser fusion target.



Laboratory for Laser Energetics/Science Photo Library

high speed cameras as they usually operate at speeds between 20,000 and more than a million frames per second.

To achieve even higher speeds the camera must have no moving parts at all. Instead the image is switched from one frame of film to another by electronic means.

Image converter cameras, as these machines are known, operate somewhat like an ordinary television camera. Light entering the camera strikes one side of a *photocathode* (a light sensitive plate) which converts the light into a stream of electrons. These are accelerated along an evacuated glass tube—the 'image tube'—and because they have no mass, they are easily and extremely rapidly deflected vertically or horizontally by applying suitable voltages on to a series of electro-magnetic 'deflector plates'. After deflection, the electron stream strikes a phosphor screen which turns it back into photons of light that are then imprinted on film.

Although the conversion of light into electrons and electrons back into light may seem needlessly cumbersome, the method works because electrons are so much easier to manipulate than photons of light. The fundamental trick of ultra-high speed photography is to move an image extremely rapidly on to different frames of a strip of film.

The fastest commercial camera in the world is an image converter camera built by a British company, Hadland Photonics Ltd. Their Imacon 790 can take pictures at a rate of up to one billion frames per second.

Like the other ultra-high speed cam-

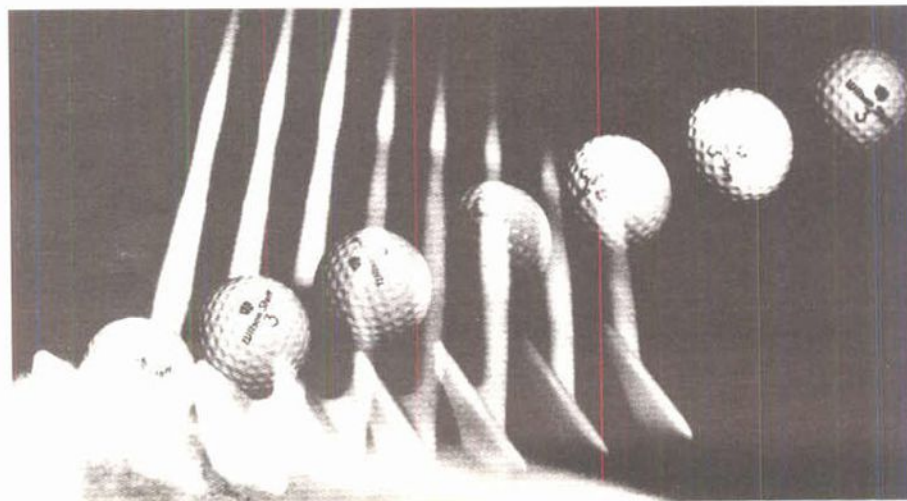
eras, the image converter camera does not, in fact, take that many frames. The films they produce are not normally the kinds of films that are projected on a screen. Instead they produce a short length of film on which are a small number of sequential pictures or a streak record.

This is because the events that they record only last for the briefest instant. The resulting pictures are black and white, though they are sometimes artificially colour coded later. Standard Polaroid or other types of film may be used depending on the illumination.

It is a long way from Edgerton's strobe-lit photographs of the 1930s to the modern frontiers of high speed photography. Edgerton's exposures of one millionth of a second are an eternity compared to the Imacon's ability to make an exposure that lasts for just one millionth of a millionth of a second—one picosecond.

Although Edgerton froze and made visible otherwise invisible events, most of his subjects were at least familiar. Picosecond photography, on the other hand, is the domain of sophisticated research in biochemistry, fibre optics atomic fusion and other esoteric fields. The images produced are as alien, and apparently abstract, as those from very high magnification electron microscopes. At the far reaches of photographable time, the only events that display any movement occur inside molecules and atoms. In one picosecond, a Concorde aircraft flying at top speed advances a distance equal to the diameter of 10 hydrogen atoms!

Golf iron striking a ball Taken using a multiple-flash strobe which allows 1000 exposures to be made every second

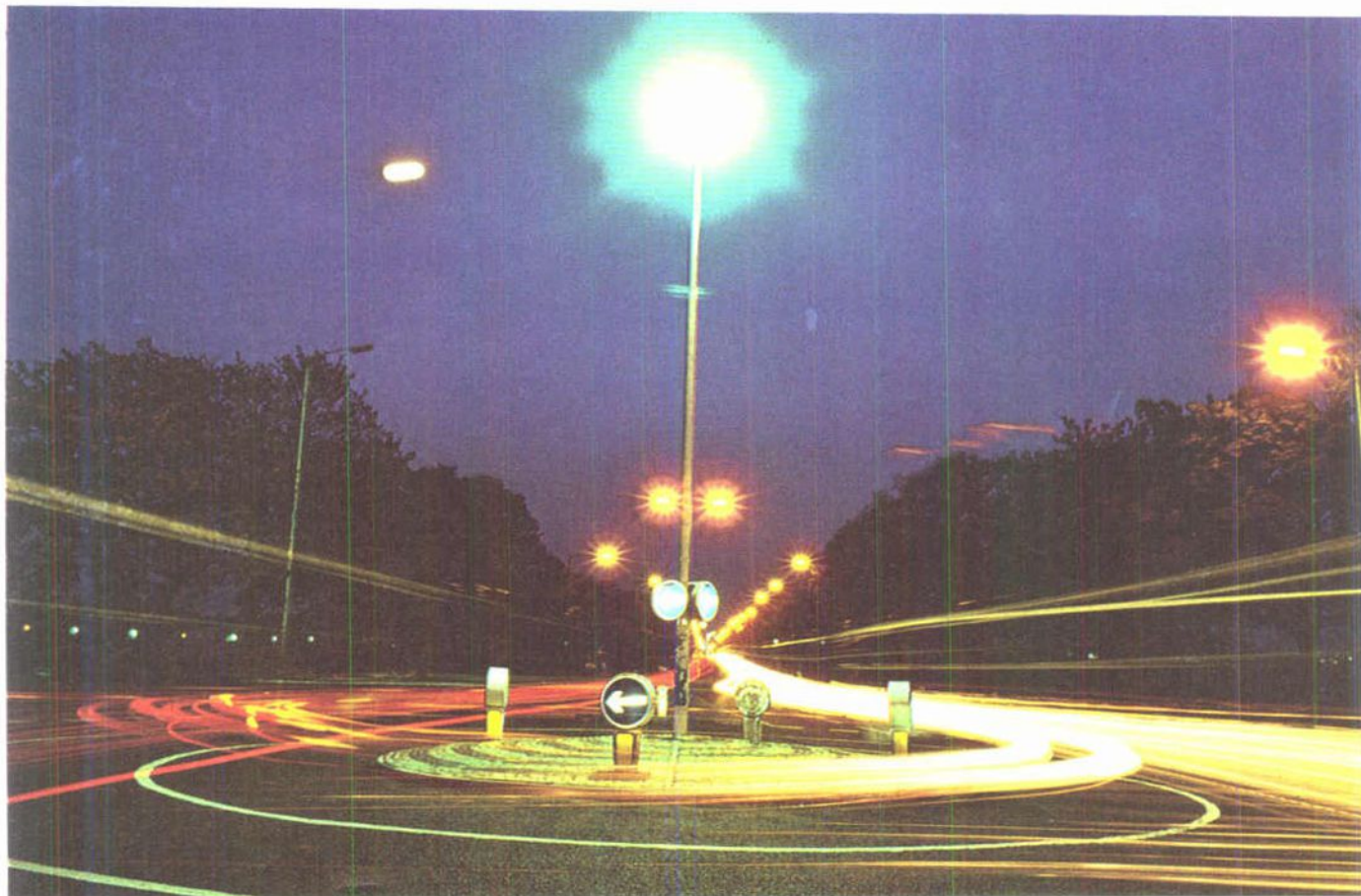


Dr Harold Edgerton/Science Photo Library

Improve your technique

A shot in the dark

Your camera does not have to be locked away as soon as the sun goes down, and a flash gun is not always necessary for taking pictures at night. Fast films, modern lenses and time exposure techniques make it much simpler to take striking pictures after dark



Ian McKinnell

Taking pictures in the dark seems a contradiction in terms—and indeed it is, for every photograph needs light. But it is very rare to find yourself in total darkness—other than in your darkroom—so there is generally some chance of a picture even in very low light.

It often happens that pictures present themselves at night, but remain unphotographed either because there was no camera to hand or because there was hardly any available light. Even modern emulsions are not as sensitive to light as the eye, so inevitably it is not possible to photograph some scenes, particularly those involving some action, just as you saw them. But it is often possible to take some sort of shot by using the right technique.

The range of low-light photographs that you might want to take includes street scenes at night, candid photography in dark locations, views of floodlit buildings, illuminations, and dimly lit interiors. And there are special effects which make use of the fact that the only light appearing in the picture is what you put there.

Night scene *Using a long exposure, with the camera on a tripod, produces bright streaks from the head and tail lights of all the passing vehicles*

Flash photography outdoors at night is a subject in its own right which is dealt with in a subsequent article.

In general, night photography subjects divide into those where conventional daytime camera techniques with a hand-held camera are adequate, and those where extra help is needed. The first category includes street scenes in brightly lit areas, some illuminations and interiors. Subjects where there is not enough light for conventional photography include such subjects as moonlit landscapes, streets where there is little light, and occasions where you are not prepared for low light photography and have to use whatever means are to hand.

Hand-held camera

Many low light scenes can be photographed normally using a hand-held camera. It is often necessary to do this: you may be trying to take candid photo-

graphs in the street, or there may be some action which you have to keep up with. The limitations are the amount of light available, the speed of your film, the maximum aperture of your lens and its focal length.

With slow films, it gets too dark for normal picture taking shortly after sunset, unless you photograph the night sky. Fast films (see page 37), however, allow you to continue somewhat longer in to the twilight, using a shutter speed of 1/60 second and the camera's maximum aperture of, say, $f/2$. One normally tries to avoid taking pictures at shutter speeds slower than 1/60 second, but as the light gets dimmer this becomes necessary. It is usually possible for most people to hand-hold exposures of 1/30 and even 1/15 second using a standard lens, with care (see page 155).

Once you have reached 1/15 second, your first option is to change to a wide angle lens, if you have one. Any blur caused by camera shake will be less noticeable with a wide angle lens. But even this will only allow you to use 1/8 second exposure with extreme care.



R. Ian Lloyd/Susan Griggs

Your next option is to rate the film at a faster speed, tolerating the loss of picture quality which this involves. This can only be done with certain films—it is impossible with Kodachrome, and while colour negative films will tolerate some underexposure they cannot be processed specially for higher speeds. Ektachrome and other E6 process films can, however, be push processed by one or two stops, as can most black and white films. The ways in which this can be done are covered in Darkroom articles. Alternatively, many processing laboratories will push the film speed for an extra charge.

Using film at 800 ASA(ISO) in a camera fitted with a wide angle lens, with a maximum aperture of $f/1.7$ and a shutter speed of $1/15$ second will allow you to take pictures in quite poor street lighting, or in dimly lit interiors. You are limited, however, to slow moving subjects. Any subject movement will require a shutter speed of at least $1/50$ second for sharp results. Depth of field will also be very restricted under these conditions.

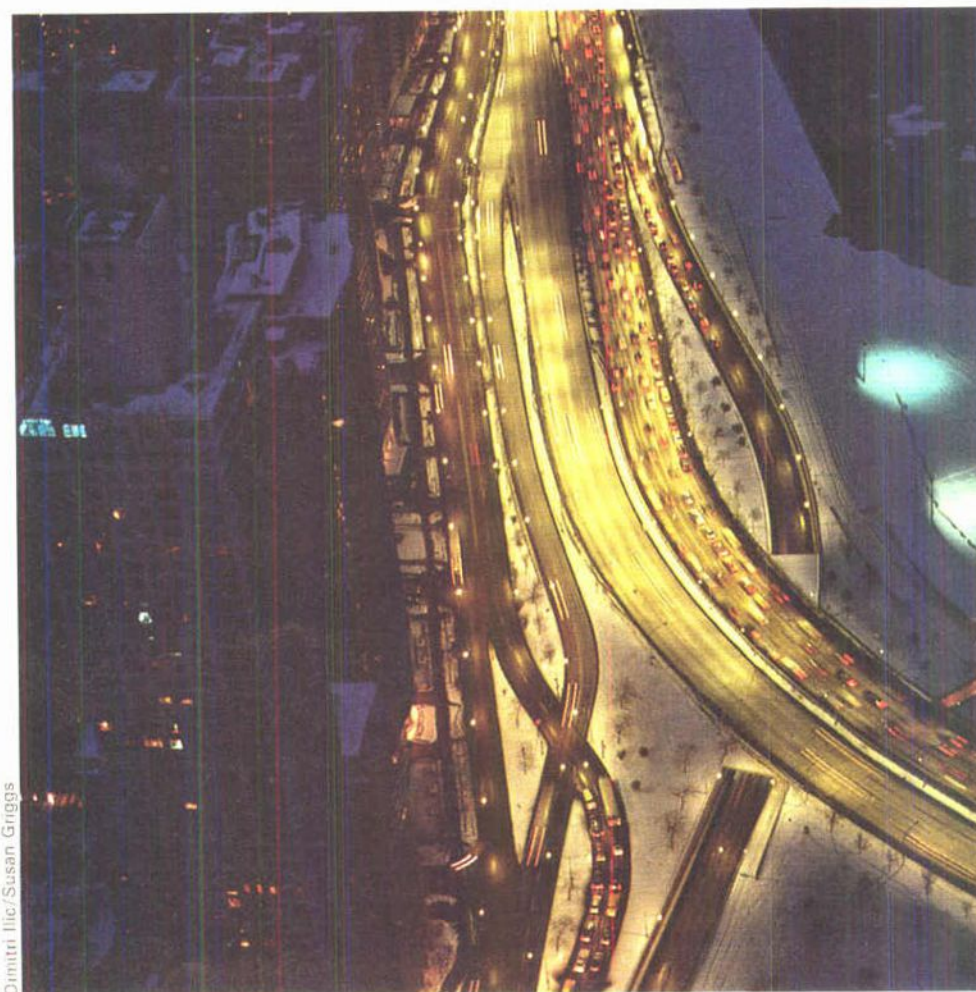
One further option available if you need to take low light level pictures is to use a larger camera format. This will not result in extra light on the film, but it will be possible to use fast film without the graininess becoming excessive, since your negatives or transparencies will be bigger compared to the grain size. Roll film or larger format cameras do not usually have lenses as fast as those on 35 mm cameras, however, so there may be no overall gain. And the extra bulk of the camera may make it more difficult to use in those situations where a hand-held camera is needed.

Using a camera support

If you hold the camera steady by using a tripod or some other support (see pages 154 to 157), many more things become possible. Exposure times can be as long as desired, which means

Passing clouds At night in a moonlit landscape, time exposures can transform a picture. Here the movement of the clouds has spread them across the frame

Spaghetti junction A high viewpoint sometimes produces a picture which is totally different to one taken at ground level—these roads look map-like



Dimitri Ilic/Susan Griggs

that you can use slower films for better definition. The limitation, however, is that moving objects will record as streaks, or may not even register on the film at all—though this can be used to advantage.

When using a tripod or camera support, it is advisable to operate the shutter using a cable or air bulb release. These usually screw into the shutter release button and allow you to fire the camera off without touching it. As well as making it unnecessary to touch the camera, a cable release tensions itself against the top of the camera body into which it is screwed, rather than pushing down on to the tripod itself. This also helps to prevent vibration.

A cable release at least 30 cm long is desirable. Air bulb releases are generally at least 2 metres long, so the photographer can be some way from the camera operating it.

Most cameras these days, other than the simplest, have facilities for long exposure times. Most often there is a 'B' setting, either on the shutter speed dial, or as an alternative to the automatic exposure setting. With the camera on 'B', the shutter stays open for as long as the shutter release is pressed. If you want to give exposures longer than a few seconds, it is a good idea to use a cable release with a screw lock on the end. The procedure is to press the cable release to open the shutter, screw the



Dinner party With fast film, it is possible to take pictures even in dim lighting. The exposure here was $1/30$ sec at full aperture— $f/2$ —using a standard 50 mm lens



Candlelight Wide angle lenses can be used without danger of camera shake at even slower shutter speeds. Switching to a 28 mm $f/2$ lens made this shot possible at $1/15$ sec

locking knob tight, and leave the camera for as long as desired. When the time comes to close the shutter, hold a finger against the cable release end, undo the screw lock and close the shutter by relaxing the spring tension of the cable release. This prevents the violent jerk which may happen if you simply undo the screw lock.

If an unwanted object seems about to enter the field of view during the exposure, you need not end the exposure prematurely. If the surroundings



Party snaps When your subjects are moving, flash is not the only answer. Here the 400 ASA film was pushed by one stop to allow a speed of $1/60$ at $f/2$

are dark enough you can interrupt the exposure by holding a dark card, cloth or even a hat over the lens. As long as you do not disturb the camera, you can remove it when the object has gone.

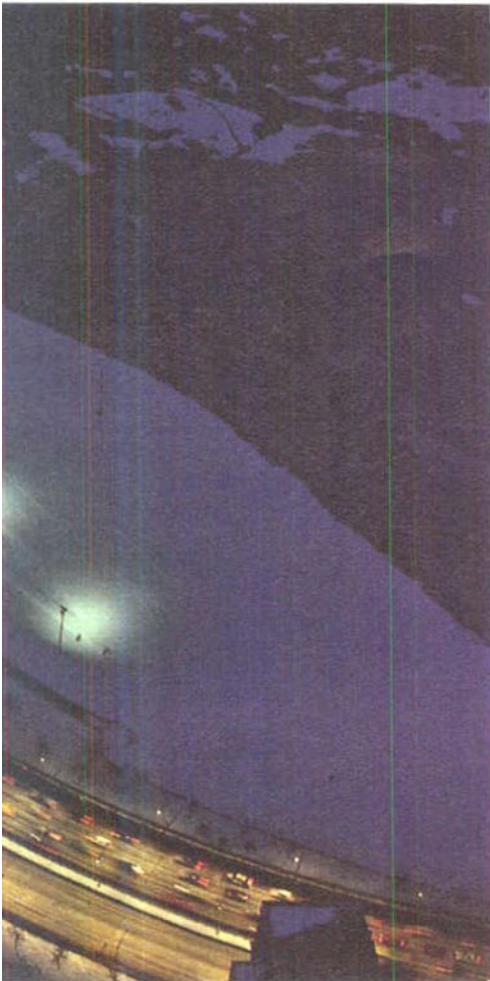
Time exposures of this sort can be used in a wide variety of situations. As well as allowing you to take pictures in places where there is very little light, or where you want to use slow film or a small aperture, they enable you to create special effects. The classic example is the trailed lights of moving cars: it may be necessary to stop down the camera in order to get a sufficient number of trails for an interesting shot. Alternatively you can experiment with a wide range of similar effects by walking along with a torch pointing towards the camera during the exposure.

People in a street will blur in an

exposure no longer than $1/4$ second, while retaining enough characteristics to show who they are. Dark moving objects may disappear altogether if they have a light background, as the brightness overpowers any trace of them. Time exposures can be used to make a busy street appear deserted (see page 343), or at least populated only by ghostly figures.

By operating a flashgun at some point during the exposure, a sharp but faint image of a person may register within the blur. The exposure which the film receives depends on the aperture it is working at rather than on the total exposure time. If you calculate the flash exposure as you would normally, then you may get overexposed results if the subject in the flash appears against a light background. On the other hand, if it is possible to operate the flash when the subject is against a black part of the picture, the exposure will be normal.

There are, however, additional problems to be borne in mind when using



Tapdance

Tapdance



Dark street Shop windows at night make an interesting subject, but without additional light the shadows are black and empty, and the glare of the window is all that appears



Add a flash Using a flash in addition to a time exposure produces a much better picture. Detail appears outside the window, which still retains a cheery glow

flash at night. The guide numbers on flash units usually assume that there will be some reflections from walls, so in the open the flash apparently has less power. And anybody with dark hair, complexion or clothes may tend to disappear against a black background. For these reasons, it is not possible to give rules about how to tackle such situations, as the results depend entirely on the conditions at the time.

This technique of using flash can be extended to 'painting with light'. This involves moving around an otherwise dark subject with a portable flashgun, setting it off to illuminate parts of the subject at a time. The operator has to make sure that he or she does not appear silhouetted against the surface being illuminated unless this is specifically required.

Using this technique, you can either use a single flash on each part of the area to be covered, or you can add flashes from the same location to produce more illumination. As for exposure, you can use the guide number system to calculate the aperture needed on the camera for a given flash distance. Then as long as you do not overlap the flashes,

you can use the camera as far away from the subject as desired providing the distance from the flash to the subject remains the same as your calculated flash distance. The size of the well illuminated area in the picture, however, decreases as the camera is moved farther from the subject.

This system only works if the flash is pointing more or less away from the camera. Side illumination requires much more exposure, and also runs the risk of allowing the flash to shine directly into the camera.

It is possible to use tungsten lighting, or even a bright torch, to paint a surface with light in the same way, but unless you use the appropriate film or filters (see page 241) the results may have a warm colour when using colour film.

When giving time exposures in this way at night, watch out not only for cars and people entering the field of view, but also for the flashing lights of aircraft in the sky beyond.

In the garden By leaving the shutter open and 'collecting' a series of images on the film, you can produce a wide range of imaginative pictures



Jean-Paul Nacivet/Atlas



Laurie Lewis

Exposure and metering

One major problem when photographing at night is that the camera's own meter may not be sensitive enough to give a reading. Alternatively, it may be misled by bright lights in the field of view into giving less exposure than is really needed. In many viewfinders the reading may not even be visible as the numbers can only be seen against the brightness of the subject.

If you are using slow film and want to give a time exposure, many meters will not give an indication as their scales stop at one second. In such cases put the meter on a higher film speed until you do get a reading. Then work out how many stops extra exposure you must give. For example, if your meter does not respond at 64ASA and full aperture, but gives a reading of one second at 500 ASA, then you must give three stops extra exposure (doubling the film speed



Moving subjects For pictures like this, it is essential that parts of the subject lit by the flash keep still. If they move about, the lights behind can burn out their image



gives one stop: the sequence is 125 – 250 – 500). So you must give 8 seconds' exposure on 64ASA film.

To this must be added the complication of reciprocity failure (see page 466). This may result in an 8 second exposure being extended to 30 seconds.

Faced with such problems, many photographers take the easy way out and bracket their exposures—that is, they give several different exposures in the hope that one will come out. This is often the best procedure, but it is also good technique to be fairly certain of your starting point.

To prevent the meter being fooled by bright lights, aim to avoid them when metering, and give the indicated exposure even if the lights are to be part of the picture. With fully automatic cameras this may involve guesswork or resetting the film speed dial.

If you cannot read the camera's

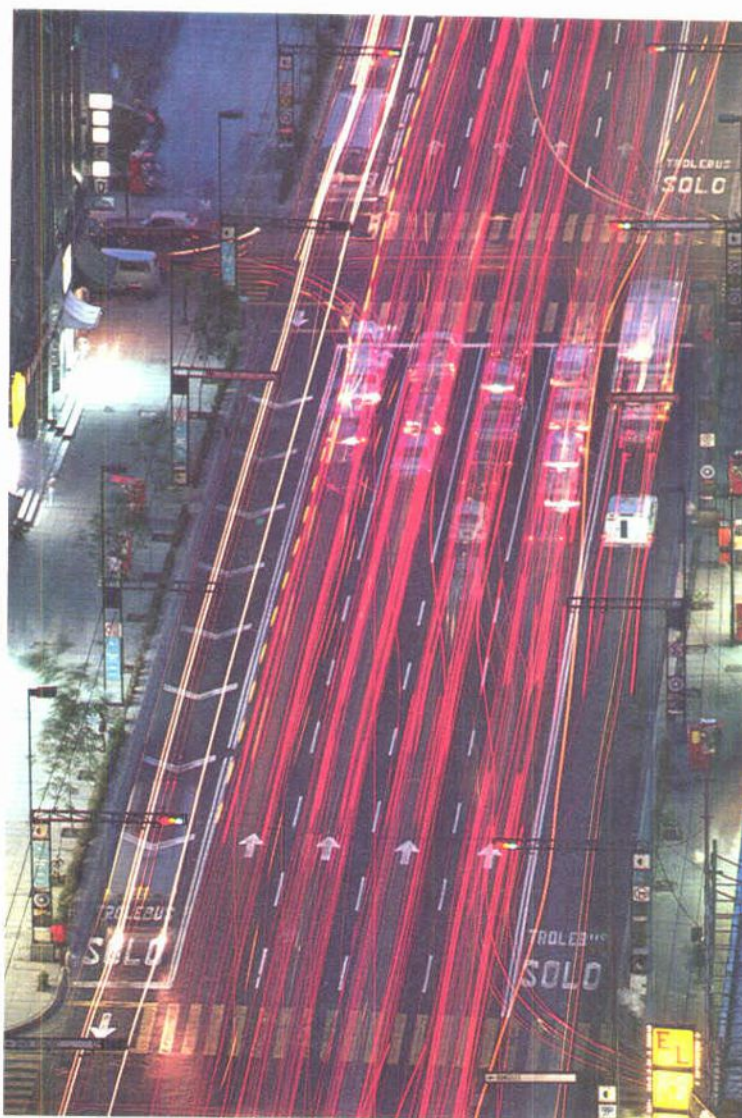
internal meter, you may have to turn it so as to be able to see the needle or figures against the brightest part of the view. If this is not possible, then guesswork again has to take over.

Working in the dark

As well as there being too little light to take pictures, photography in the dark also means that you may have trouble in operating your camera.

A most useful accessory is a small torch. As well as allowing you to see the camera settings, it can also be used either to throw some light on the subject, or to place on the subject to give you a reference point to focus on. It also comes in handy should you have the misfortune to have to search for some small item of equipment on the ground.

When taking candid shots at night, it is not possible to use a torch for focusing. One solution to this problem is to glue



Sergio Dorantes

Freeway in focus Night scenes are sometimes surprisingly bright, and to allow really long exposures you may find that you have to stop the lens down to a small aperture

Subway scene Lighting in many public places is bright enough to permit hand-held candid shots with fast film. Fluorescent lighting gives a characteristic green tint

or tape small pieces of matchstick to the focusing ring index mark of your lens. Suitable points might be at the two and four metre marks, for example. Then you can either line up the pieces of matchstick or guess some midway position. With the two focusing extremes, this method gives you four reference points for focusing.

To operate the aperture ring in the dark, get used to how many click stops there are between maximum and minimum apertures. The wider apertures usually have half click stops, so memorize how many there are.

Strips of tape, such as masking tape, can help you distinguish between lenses of similar size in the dark. Stick different numbers of strips round the barrels.

Practice loading and unloading in the dark. To prevent loading a film already exposed, be sure to wind each film fully back into its cassette.

Prints from slides-2

A look at the Ektachrome 14 RC prints from slides system, which is a widely available alternative to Cibachrome, and how to go about correcting colour casts when making direct positive prints



Raul Constanicio

Although the Cibachrome process (see pages 621 to 625) is very simple and easy to use when making prints direct from slides, you may find that the major alternative, the Ektachrome process, has distinct advantages if you use Ektachrome film.

Methods of exposure and filtration are the same and the main difference between Cibachrome and Ektachrome systems lies in the way the image is formed.

The Cibachrome system uses the silver dye bleach principle, where dyes in the print emulsion in those areas exposed to light are destroyed during development, forming a direct positive image.

In the Ektachrome system, the dyes are obtained in a similar way to those in colour slide processing. Processing begins with the first development stage, and this produces a negative silver image in each of the three colour sensitive layers of the emulsion. In a subsequent stage, colour development, the image is reversed to a positive colour image by dyes that do not form in the negative areas of the print. All the silver

Ektachrome 14 RC process kits



Tetenal UK 3 A kit of concentrates which can be broken down into part quantities, if required. Instructions indicate various process methods and temperatures. Claimed capacity of the solutions is about 0.5 m²/litre



Agfa prints from slides outfit Kit has both paper and chemicals, each compatible with the Kodak process. Process times are quoted for 30 °C and 38 °C where total times are 18 minutes and 12 minutes respectively

is removed in the last main stage of the process—that is, a bleach-fix bath to leave the final positive, coloured dye image on the print.

Setting up

The Kodak 'Starter Outfit' contains a packet of 10 sheets of Ektachrome 14 RC paper, a 1 litre Ektaprint-R three-bath processing kit, a measuring cylinder, and three plastic storage bottles. Besides the kit, however, you will need a container and stirring rod for mixing the chemicals, an accurate thermometer and a drum (or dishes) for processing the prints. For exposing Ektachrome prints you can use almost any enlarger providing it has either a filter drawer or an adjustable colour head. Ektachrome 14 RC paper is much more sensitive than Cibachrome and you must take particular care to eliminate any stray light in the darkroom. It is sensitive to all colours of light and must be handled in total darkness up to, during and immediately after exposure—no form of safelighting can be used. Nevertheless, this should present few problems if you use a processing drum, and even if you process in dishes—as you can for Ektachrome—the lights can be switched on soon after first development.

You can identify the emulsion side in the dark by moistening your thumb and forefinger and carefully pinching the extreme corner of a sheet of paper. The tacky side indicates emulsion.

Ektachrome paper should not be stored at temperatures above 20°C. Kodak recommend that if you keep it for longer than two months, storage tem-

Choosing the slide As with Cibachrome, you must take care to choose slides to match Ektachrome 14 RC's own characteristics to get the best results

perature should not exceed 10°C, otherwise colour characteristics may change slightly. You can store the paper in a refrigerator but, if you do, you must take particular care to completely seal it against moisture. To prevent condensation forming, allow several hours warming up before the paper is used.

Unlike Cibachrome, Ektachrome 14 RC must be processed immediately after exposure. If you have to make a large number of prints, do not expose more prints than you can process at once.

Exposing 14 RC

Ektachrome 14 RC is more sensitive than Cibachrome, and needs two or three stops less exposure. So for your first exposure test, stop your enlarger lens down further than normal for black and white printing (say, to $f/11$) and cover a range of times such as 5, 10, 20 and 40 seconds—about a quarter to a tenth the exposure likely for Cibachrome. For a typical slide, the best exposure on a zero filtration print (see page 625) is likely to be between 5 and 10 seconds. You must establish exposure accurately before proceeding with any filtration tests, so make a second test print using a shorter range of exposures, such as 2, 4, 6 and 8 seconds.

Do not attempt to judge exposure or colour balance until the test prints are completely dry after processing—wet Ektachrome 14 RC prints have a marked blueish tinge which makes correct assessment of colour balance impossible.

With the exposure time established, you can make the second series of test prints to find out the filtration needed to correct any colour cast. The zero filtration print should give you some idea of the colour cast, but you should start with the correction needed for the characteristics of the paper you are

Process stages

	Agfachrome Process R	Kodak Ektaprint R14	Photochrome-R	Tetenal UK3	Unicolor RP-1000
Process temperature	38	30	25	38	41
Process stages (mins):					
Presoak bath	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1
First developer	$1\frac{1}{2}$	3	5	$1\frac{1}{2}$	$1\frac{1}{2}$
Wash	$1\frac{1}{2}$	3	3	2	2
Colour developer	2	$3\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{1}{2}$	3
Wash	$\frac{1}{2}$	2	1	30s	$\frac{1}{2}$
Bleach-fix	$2\frac{1}{2}$	3	4	2	2
Wash	2	3	4	2	$1\frac{1}{2}$
Drying	do not exceed 70°C				
Total	11	18	$22\frac{1}{2}$	$11\frac{1}{2}$	$11\frac{1}{2}$
Part make-up			yes	yes	yes
Other process temps for which times are quoted	30	38	30/35	24	24/32

using. Unlike most other papers, batches of Ektachrome produced by Kodak are not marked with initial filter packs to correct for batch characteristics, so you may have to make a new test for each batch of paper. However, Kodak suggest that you begin with a 20 cyan filter and this usually gives good results with Ektachrome slides. Agfa, on the other hand, give the initial correction needed with every batch of paper. Typically this is (30 10 00), otherwise 30Y + 10M.

Make corrections for colour cast in exactly the same way as for Cibachrome. Use as little filtration as possible and



Ektaprint R-14 This kit is matched to Ektachrome 14 RC paper. A starter kit with both items, a 600 ml measure and three storage bottles, is available. Prepared solutions have a fairly restricted storage life, however



Photochrome R Another widely available alternative to the standard process kit is this easy to use five part kit. It contains very clear instructions and includes suggestions on processing and printing techniques



Unicolor RP-1000 Suitable for use with Ektachrome Type 2203 RC paper as well as 14 RC. A seven part, three-bath process kit, it can be broken down into smaller working quantities, and can be used at a range of process temperatures

never use yellow, magenta and cyan together since this simply reduces the overall light output. To reduce a colour cast, simply remove filters of a similar colour from the filter drawer, or add its complementary. Yellow is rarely used when printing from slides, but cyan filtration is often needed to remove a red cast, or used in combination with magenta—making blue—to remove a yellow cast.

The Ektaprint R 14 process

Ektachrome paper is processed using the basic Ektaprint R 14 process. This is an updated version of the original

process and is much easier to use because it includes a chemical fogging agent—with the old process you had to expose the print to white light after first development to achieve reversal.

The Ektaprint R 14 chemicals are all liquid concentrates and are prepared simply by diluting with warmed water. But, remember to wear gloves when you are mixing the chemicals and follow the maker's instructions carefully. Unlike Cibachrome chemicals, Ektaprint chemicals do not have to be neutralized before disposal but you should use plenty of water to flush away discarded solutions. Wipe up, rinse and dry any chemical

spills to prevent staining.

The Ektaprint R 14 kit offers you a choice of two process temperatures: 30°C and 38°C. It is better to adopt the lower of the two temperatures unless you are confident you can correctly maintain the more awkward higher temperature. Whichever temperature you choose, place all the solutions in a water bath to bring them up to the required temperature. Also place in the water bath, a container holding about 400 ml of clean water.

If you are using a print drum for processing, place it in a water bath after loading the print to bring the temperature

Correct filtration

1 This is the best possible corrected print, in that skin tones and subject colours are rendered accurately

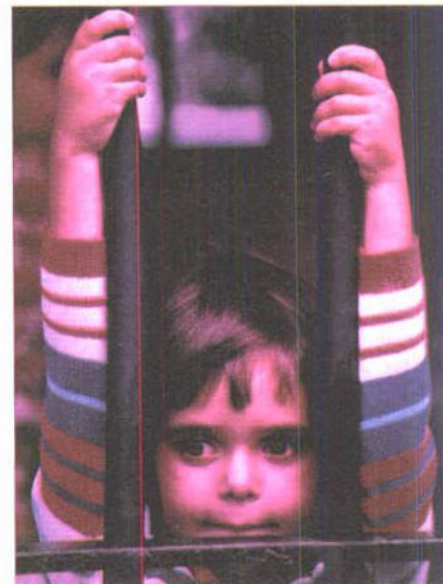
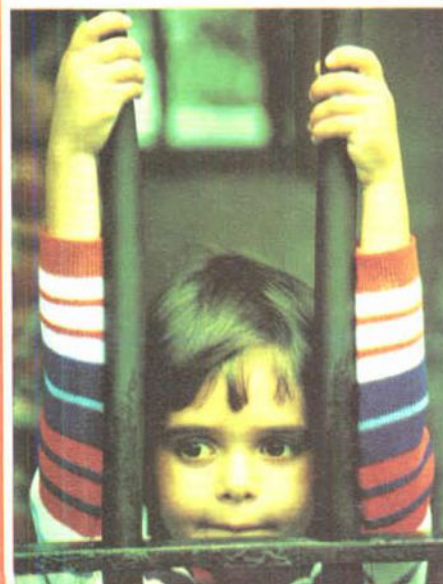
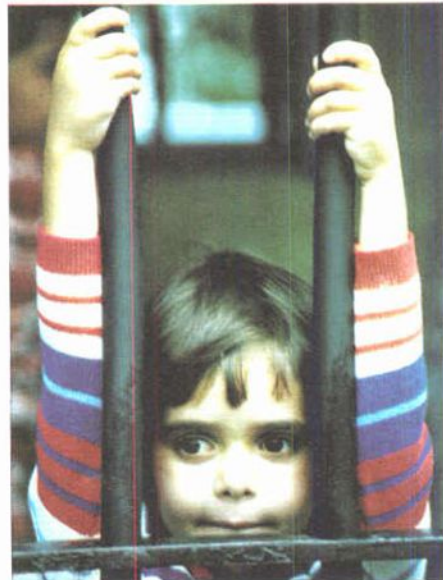
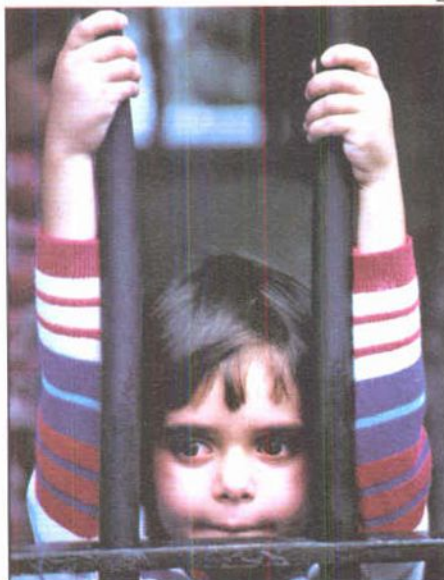
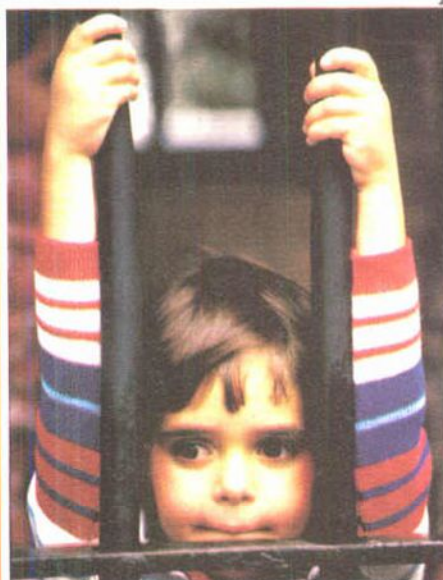
2 This print is too blue. Correction is obtained by reducing magenta plus cyan filtration by about 30 units

3 Reduction of 30 units cyan, or the addition of 30 units each of yellow and magenta is required to eliminate this cyan cast

4 Excess green shown here can be removed by reducing yellow and cyan filtration by 30 units, or by adding 30 units magenta

5 This yellow cast can be removed by removing 30 units yellow, or, alternatively, by adding 30 units magenta and cyan

6 This magenta cast is removed by 30 units additional yellow and cyan filtration, or by removing 30 units magenta



Colour corrections for reversal prints

For reversal printing you have to abandon correction routines used for conventional colour printing from negatives. However, correction of colour casts is fairly straightforward—simply remove from the filter pack or colour head filtration which corresponds to the colour of the cast. The options are shown in the table.

Remember:

- If you use filters in a filter pack, use as few filters as possible
- Make adjustments by removing filters if you can
- Do not use yellow, magenta and cyan filters together

	Necessary corrections		
the print is too light	use smaller aperture	OR	shorten the exposure time
the print is too dark	use larger aperture	OR	increase the exposure time
the print is too blue	reduce the magenta cyan filtration	OR	increase yellow filtration
the print is too yellow	reduce yellow filtration	OR	increase the magenta + cyan filtration
the print is too green	reduce the yellow + cyan filtration	OR	increase magenta filtration
the print is too magenta	reduce magenta filtration	OR	increase the yellow + cyan filtration
the print is too red	reduce the yellow + magenta filtration	OR	increase cyan filtration
the print is too cyan	reduce cyan filtration	OR	increase the yellow + magenta filtration

of the drum and print up to the correct level. Once you think they have reached the right temperature, you can begin the first development. This is the only really critical stage of the whole process and you must take special care to ensure that the solution temperature and process time are strictly adhered to. You must also adopt a uniform method of agitation if you are to achieve consistent results. Roll the drum rapidly, but gently, to and fro, completing one or two complete revolutions every second.

Begin draining the developer just before the end of the development time and immediately rinse the drum with about half of the clean water from the container in the water bath. After a little agitation, empty the water out and refill the tank with the remainder of the clean water. At the end of this second wash, you can remove the drum lid and complete the rest of the process in the light.

Once the tank is open, give the print a third wash in running water. If you are processing at 38°C, this wash must last two minutes, but if you are processing at only 30°C, the wash need only continue for 90 seconds. After the third wash, remove the print from the drum for this stage, but take care to handle the delicate material only by its edges—the emulsion is easily scratched when wet.

Replace the print and reassemble the drum. Pour in the measured quantity of colour developer. Timing is not critical,

but this stage must be carried to completion, so err on the generous side, continuing development a little beyond the recommended time.

Once colour development is over, wash in warm water from the remaining container, again using two separate baths. Start the bleach-fix bath but, again, be careful not to cut short the process. After another wash, lasting three minutes, dry the print in the normal manner.

Because many of the stages can be carried out in full lighting, it can be a nuisance to use a print drum for all the stages after the first wash. You can, if you prefer, switch to dish processing after first development if you can successfully maintain the recommended 30°C process temperature. In fact, it may be worth doing all the processing in open dishes, providing you can control timing and temperature accurately. But you must take special care not to splash and cross-contaminate the various processing solutions. This is a problem with any type of dish processing, but it is much more severe when you cannot see what you are doing.

Alternative process kits

One of the main attractions of using the R 14 system is that there are a number of alternative process kits available. Agfa, for instance, provide a 'DIY Prints from slides' outfit which contains two packets (20 sheets in all) of their own paper for

prints from slides, Agfachrome PE, plus the necessary process chemicals. The paper is fully compatible with the Ektaprint R 14 process, and Ektachrome 14 RC can be processed in the Agfa Process R chemicals provided—so Agfa components are readily interchangeable with those made by Kodak.

Other manufacturers supply kits of process chemicals only. The attraction of these is not necessarily one of initial cost, but the economy possible by mixing up only the amount of solution required for a particular printing session. All kits contain liquid concentrates and it is a simple matter to measure off a little at a time. Working strength solutions are normally used only once before being discarded, but some can be used more than once when economy, rather than quality is important. The manufacturers give precise instructions for reusing chemicals.

Process times vary only slightly, and all processes have the same number of stages but chemicals may differ slightly from manufacturer to manufacturer and this may cause small differences in colour balance and saturation: you may find you prefer the result from one particular process. But whichever process you choose, Ektachrome is essentially a straightforward printing system, and providing you take the necessary care at all stages, it should give excellent colour prints from your slides.

Lens combination

The focal characteristics of a lens are usually determined by the arrangement of its elements, but can be changed by adding supplementary lenses



George Wright

With an SLR, you normally change focal length and angle of view by removing the lens from the camera and replacing it with another 'interchangeable' lens. But sometimes it is easier or cheaper to retain the lens on the camera and alter its characteristics with supplementary lenses placed in front or behind. On cameras with fixed lenses, supplementary lenses may be the only way of obtaining a different focal length.

There are many kinds of supplementary lenses, but only three are in common use: teleconverters, wide angle converters and close-up lenses. Of these three, the most familiar to SLR users is the teleconverter which is usually fitted behind the main lens to increase focal length. Close-up lenses and wide angle converters, on the other hand, are always fitted to the front of the lens.

Changing focal length

With a normal camera lens, light passing through the lens

converges on the focus of the lens (see pages 270 to 271). With a lens of short focal length it converges very sharply; with a lens of long focal length it converges only gently—that is, a long way behind the lens. The degree of convergence—that is, the focal length of the lens—controls the size of the image so that a short focal length/sharp convergence produces a small image and a long focal length/gentle convergence produces a large image.

A supplementary lens can alter the size of the image by altering the degree of convergence of the prime lens, changing its focal length.

Teleconverters are actually divergent lenses and so, in combination with a prime lens, serve to reduce convergence and increase the focal length of the prime lens. In effect, they spread the image produced by the lens over a wider area and so the image recorded on film is that much bigger. The power of a teleconverter

Child on rug Lens converters can produce pictures with a fisheye 'look' at a fraction of the cost of a proper lens

to magnify depends on how close it is set to the main lens. If it is set very close to the main lens, it has much more effect and magnification is high. If it is set well back from the lens, the effect is decreased and the teleconverter magnifies less powerfully. With some converters, known as variable teleconverters, the lens elements can be moved around inside a barrel to give a range of magnification.

Some converters are designed to suit a wide range of lenses and tend to give rather mediocre results. Matched multipliers are designed for use with a specific prime lens and can therefore give much higher quality.

Close-up lenses

Close-up lenses also change the focal length of the prime lens with which they are used, but instead of increasing it,

they decrease it. This may seem like a paradox, because short focal length lenses generally form smaller images of the subject while the object of a close-up lens is to form a bigger image.

The explanation lies in the distance between the camera and the subject.

When a close-up lens is fitted to the prime camera lens, it makes it possible to move the camera closer to the subject and still keep the picture in focus, without moving the lens further out from the film.

Focusing of any camera lens is achieved by moving the lens either towards or away from the film. When the distance from lens to film is exactly equal to the focal length of the lens, subjects at infinity are brought into focus. Moving the lens further out from this point brings into focus objects which are nearer to the camera. For example, if a lens with a focal length of 50 mm is placed exactly 50 mm from the film, it is focused on infinity. Adding a supplementary close-up lens decreases the focal length and, to be focused on infinity, the lens need not be so far from the film. This means that the same lens-to-film distance is sufficient to focus on nearby objects.

In reality, of course, close-up lenses are used at much shorter distances than this, usually with the lens racked out as far as it will go.

Close-up lenses are very simple in construction, and usually consist simply of a single element converging lens. To work well, they must be used with the main lens stopped down to a moderately small aperture, but even then quality is indifferent.

You may also come across a more complicated type of lens that uses two elements. This type of lens is referred to as a variable close-up lens. In variable close-up lenses, the two elements are moved

together or apart to change the focal length of the unit. This, unlike the fixed close-up lenses where only a single power is available with each unit, gives a choice of powers.

The power of a close-up lens is given not as a focal length, but as a *dioptré power*. This is same scale of units that opticians use to prescribe spectacle lenses. The dioptré power of any lens is the reciprocal of its focal length in metres. This means that a lens with a focal length of one metre (1000 mm) has a dioptré power of one divided by one—that is, one. Commonly available close-up lenses have powers of one, two or three dioptrés, though powers as high as ten and as low as $\frac{1}{4}$ are available.

Afocal lens attachments

A camera with a fixed lens normally has a fixed angle of view, but there are optical devices available that can be attached to the front of the lens to change its angle of view to either a narrower or a wider one. These are called afocal lenses because they have no focal length of their own—if parallel beams of light enter at one end, they leave parallel at the other



Wider Fitted to the front of the lens, this attachment doubles the angle of view

end, and are not brought to a focus. Despite this, they actually change the focal length of any lens to which they are attached.

Afocal attachments work by changing the width of the beam of light that passes through them. A familiar example of an afocal lens is a telescope, or a pair of binoculars. When you look through the right end, you see an enlarged image, but reversing the instrument gives a minute picture.

For photographic purposes afocal attachments take the form of either a telephoto or wide angle attachment

which fits on the lens.

The basic construction of an afocal attachment is a negative and a positive component with an air space between. The order of the components determines whether the unit acts as a telephoto or a wide angle converter. If the negative component is nearest the prime lens, the result is an increase in focal length and a narrower angle of view. With the positive component nearest the lens, a wider angle of view is obtained.

The range of magnifications available from afocal attachments is limited and for



Bigger This telephoto attachment can even be fitted to a camera with a fixed lens

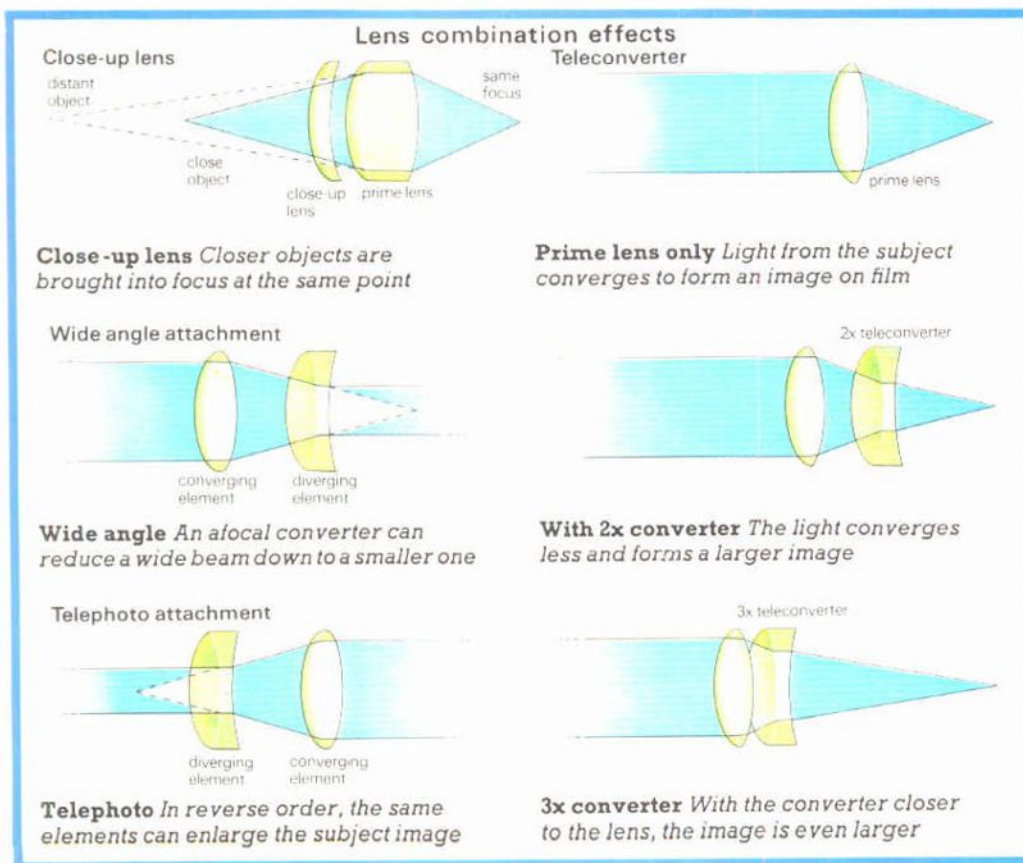
good performance a range of between $\times 1.5$ and $\times 0.7$ is about the limit. Front-of-the-lens converters are the only type that can be used on a camera with a fixed lens. The 'Mutar' attachments which were made for the Rollei camera are good examples but were made to high standards and required costly and complex designs. Cheap wide angle and telephoto converters are rarely up to such a high standard and may produce images which suffer from unsharpness, flare and other optical aberrations which will spoil your shots.

Fisheye attachments

A supplementary lens that can be very successful with an SLR is a very wide angle or fisheye attachment. Using one with a 28 mm lens can produce the familiar circular images associated with a prime fisheye lens but at a fraction of the cost. An angle of view of 150° can be obtained with a 28 mm lens and fisheye attachment.

Unfortunately, such a wide angle of view inevitably results in severe barrel distortion (see page 338). This is a fault that is difficult for a lens designer to eliminate, but fisheye lenses derive their characteristic image shape from it. A fisheye lens is really an ultrawide angle lens with uncorrected barrel distortion, and in a similar way, a fisheye converter has the same deliberate fault.

While a fisheye attachment can be used with a non-reflex camera, viewfinding becomes a matter of guesswork and it is rather easy to include unwanted objects in a picture.



Riding the wind

Air sports offer some of the most exciting subjects for a photographer and provide brilliant colours, dramatic shapes and unusual points of interest in the natural landscape



Jerry Young

Few sports are more photogenic and spectacular than hang gliding and ballooning, and seem almost 'ideal' photographic subjects. With brilliant colours, interesting shapes and plenty of action it seems that you only need to press the shutter to capture sparkling, dynamic shots. But to make the most of the photographic possibilities these sports have to offer, you must plan your pictures carefully.

The most spectacular photographs of balloons are usually taken at organized events where there is plenty of pre-light activity to photograph, and where you can see balloons at close range. At these events you may also be rewarded by the inspiring sight of a large group of multicoloured balloons rising gracefully into the sky.

Hang gliding, on the other hand, depends much more upon the geography of the area and upon conditions. Nevertheless it is becoming increasingly popular and many places have become

Aerial view *Dramatic shots await those photographers lucky enough to get a view from above. Here Jerry Young used an ultra-wide angle for extra impact*

established hang gliding sites. Like ballooning, hang gliding is now a well organized sport and it is rarely difficult to find out about forthcoming events.

Once you have found an event that appeals to you, discover as much as you can about the sport, so that you know where to look for the best photographs. Try a number of different approaches or you may end the day with a whole batch of similar shots.

Ballooning

Hot-air ballooning events nearly always take place on clear days at times when the light is ideal for photography—very early in the morning and late in the afternoon. Capturing the best conditions can mean getting up well before sunrise, but you should be amply

rewarded when you arrive in a field just as the sun climbs over the horizon to find keen aeronauts unfolding vast areas of colourful fabric, inflating the 'envelopes' with cool air and the turning on the propane burners.

With the dramatic lighting and brilliant colours, this preliminary activity is ideal for colour photography. Try shooting through the half-inflated balloons into the rising sun so that the colours of the fabric glow richly against the light. The early morning hanging must can be used to add atmosphere to the event.

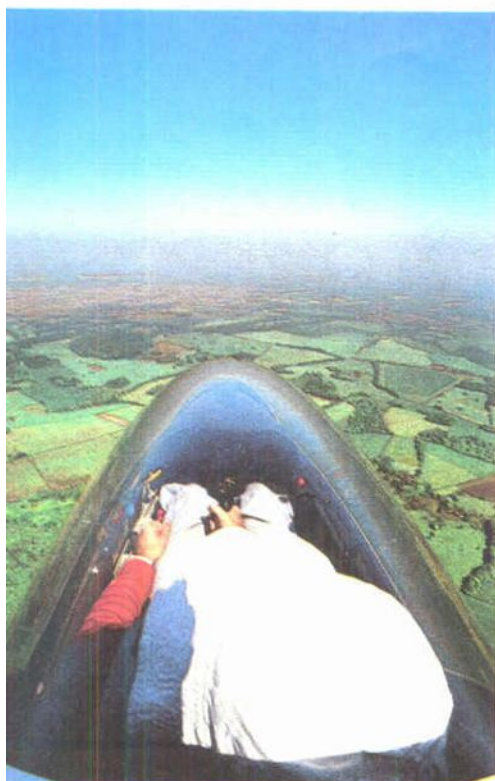
Wide and ultra-wide angle lenses—24 mm, 20 mm or even wider—are almost essential for photographing both ballooning and hang gliding—for this kind of subject, any distortion which an ultra-wide lens produces is usually quite acceptable. With a wide angle lens you can move in close and fill the frame with expanses of bright colour. Shots with a wide angle also lend a feeling of involvement, lost with a long lens. A wide

angle lens is particularly useful for close-ups of the crew preparing for take-off in the basket, framed to include some of the bright colours of the balloon. The foreshortening effect of a wide lens prevents the basket from being dominated by the balloon too severely—with long range shots using a telephoto lens, the basket often appears as just a tiny part of the overall photograph.

However, a long lens can be effective for long shots of the whole event because it compresses all the parts of the scene together to give tight composition. The best way of exploiting this is from a high viewpoint—perhaps a nearby hill.

Often you may be shooting before the sun is fully risen, and people may appear only as silhouettes. These silhouettes can look very effective—especially if there is a bright colour in the background or a slight mist around. This low light can be ideal for photographing the long flames of the propane burners, particularly if you can capture the glow of the flames in the faces of the ground crew.

Some photographers are lucky enough to climb inside the balloon while the long flames of the burner are shooting in. This viewpoint can provide some spectacular pictures, but to be allowed inside the balloon you must be on very good terms with the owner; it is very easy for the fabric to be damaged or covered in mud by someone walking around inside. If you are lucky enough to be allowed inside, try using a wide angle lens to include the inside of the fabric together with the burner and the ground crew working outside. If you can, wait for the sun to come out in order to bring out the full colour and texture of the fabric.



Jerry Young

Hang glider By shooting directly into the sun the hang glider is backlit to emphasize its shape and colour. Such objects give a new look to the land

Glider's cockpit The use of remote control cameras allows very unusual views of subjects. This was taken mounted from behind the cockpit

Before the hot-air balloons take off, ask the aeronauts about wind conditions and the proposed route so that you can choose your position for the best photographs. Either stand right in the thick of the action with a wide angle lens or stand some way forward along the probable flight path with a telephoto. Again, high viewpoints such as a hill or a tree can be useful for shots of balloons taking off.

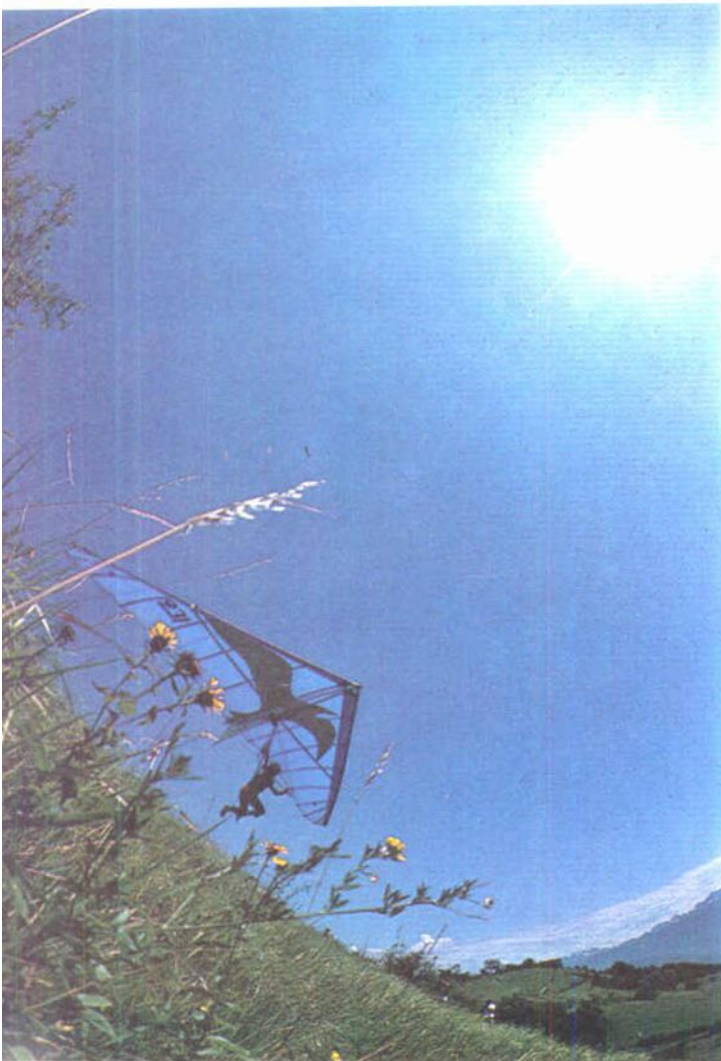
The balloons all ascend quite quickly, but they still make attractive subjects, especially in large groups. Use a long lens to pick out the colourful formations.



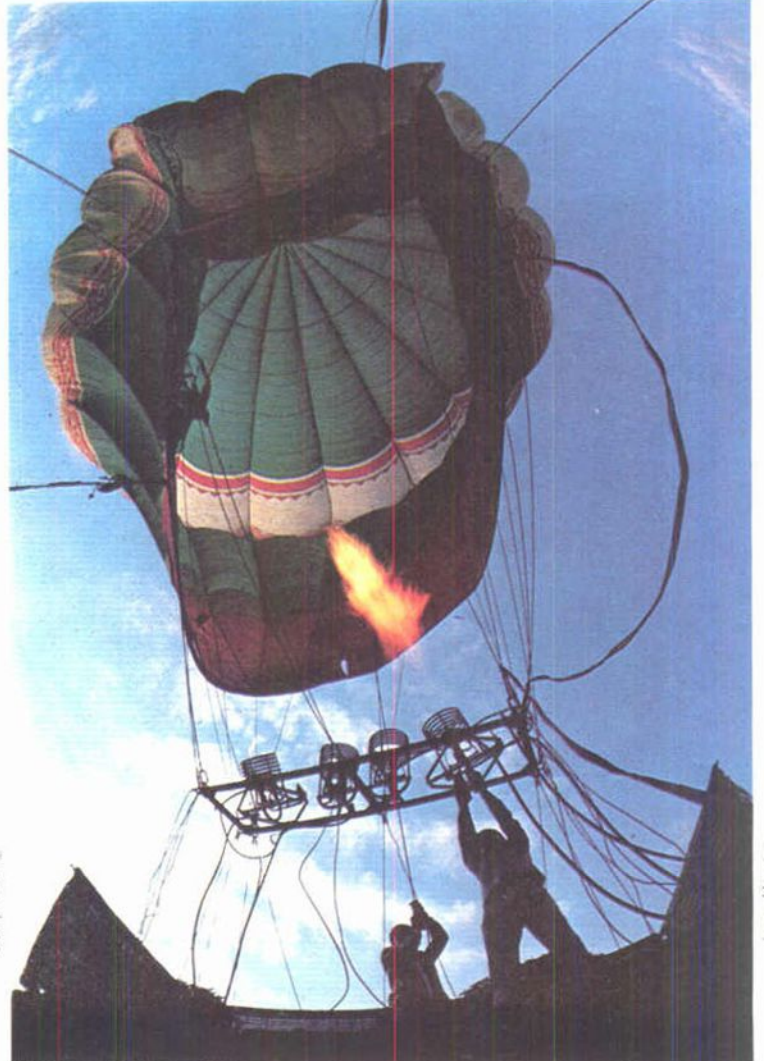
Shots of the balloons contrasted against a clear blue sky can be particularly effective. If the sun has risen sufficiently high, use a polarizing filter to intensify the colours. Load the camera with slow speed colour transparency film such as Kodachrome to give fully saturated colours. Once again, the bright colours are shown up beautifully if the sun is behind the balloons.

The balloons add a splash of colour to the scenery, so take advantage of the occasion to shoot a few landscapes. But you may have to work fast—although the balloons themselves do not move quickly the relationship of balloons to each other and to the landscape does change rapidly. Look out for contrasts such as rounded, colourful balloons above the angular grey skyline of the city. Look also for interesting reactions on the ground—perhaps animals staring up at the strange passers-by or spectators craning their necks to see.

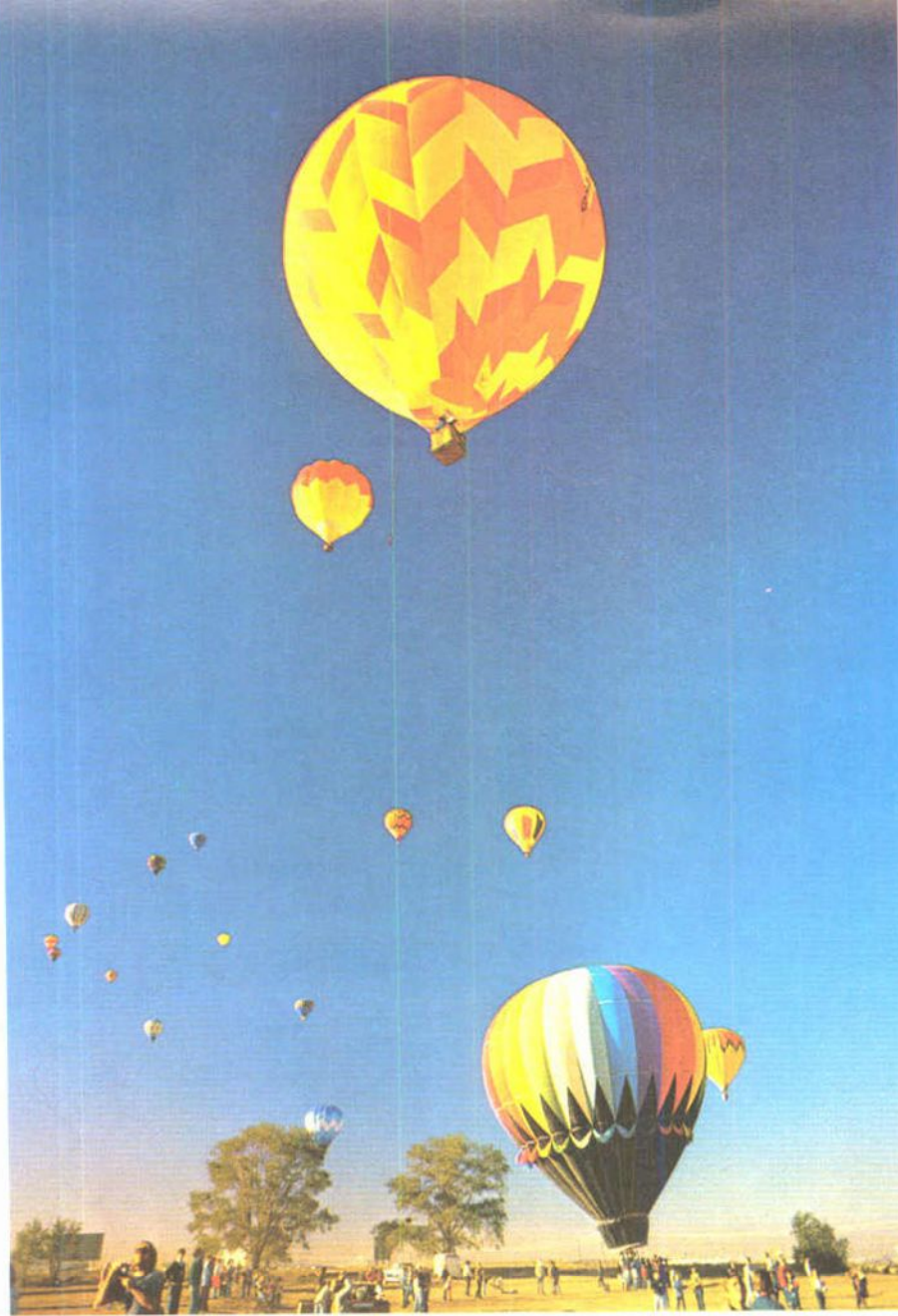
If you are fortunate enough to actually



Jerry Young







to discover exactly where a balloon will come down. Balloons often make their descents as the sun starts to set and can look beautiful against the rich colours of the evening sky.

Many of the techniques for photographing balloons can be applied effectively to hang gliding. Like ballooning, for instance, one of the beauties of hang gliding is the colourful fabric which is particularly attractive backlit. But hang gliding may also benefit from a slightly different approach.

Colourful fabric *With ballooning you have almost as many interesting things going on at ground level as in the air, so look out for colourful details*



Mass launch *One of the most useful ways of bringing out the strong colours of the balloons and the sky is to fit a polarizing filter*

Balloons in landscape *To introduce a sense of scale it is well worth photographing hot air balloons in relation to the general landscape*

go up in a balloon, remember to take your camera, for it is an opportunity not to be missed. Aerial shots of landscapes and cities, and air-to-air shots of other balloons are all exciting possibilities. You can also try hauling the camera up on a rope with a wide angle lens fitted and photographing down into the basket using a remote release. By fitting the camera on a pole or a monopod you can hold it away from you and photograph the balloon and its crew airborne—but make sure the camera is secure.

Finally, balloons can be exceptionally photogenic as they come in to land. You may be able to follow the recovery crew





Hang gliders

The best days for hang gliding are when there are puffy cumulus clouds in the sky, indicating the most suitable air conditions for gliding. Hang gliders usually take off around the middle of the day and land before sunset, so the latter part of the day is the best time to photograph the action.

There is always a good deal of ground activity before take-off. While the gliders are being assembled you can often find good shots by standing well back and using a 200 or 300 mm lens to compress the scene. The same technique can be used to photograph a line of gliders from behind as they queue up to take off.

Take-offs are often along established routes and usually involve the pilot running along until airborne. If you can safely move close to the point of take-off, you may be rewarded with a dramatic wide angle shot of a glider just leaving the ground as he runs towards you. You can also try a side-on shot with a longer lens, panning the camera at a slow shutter speed to capture the movement of the glider taking off.

Hang gliders quickly recede into the distance after take-off, so unless you are on high ground with a long lens—300 to 500 mm—you will not be able to take many good ground-to-air photographs. Whenever possible, include some of the landscape in your shots to give some idea of the scale of the glider.

Some of the most dramatic hang gliding shots are taken with remote control cameras. This technique involves clamping a camera and a motor drive to

Adventure photographer *A remote control camera enabled Jerry Young to take this dramatic self-portrait flying over the Swiss Alps*

Windsurfing *Once you have started to photograph air sports you will find that there are many other sports which are equally exciting and colourful*



a glider and composing and prefocusing the shot before take off—this may be a view from the tip of the wing looking across to the pilot. When the glider is airborne, the camera can be operated either by the pilot or from the ground, depending upon whether an electrical cable or a radio or infrared signal is used to activate the camera. If the pilot is to operate the camera, it is a good idea to explain to him or her exactly what you want. Let him look through the viewfinder before take-off.

The camera should of course be firmly clamped and completely taped up—including the camera back which could burst open in the event of a hard landing. Make sure you hide all the wires and, on automatic cameras, that the eye piece is covered to keep out extraneous light. It is very difficult to accurately estimate the exposure beforehand, so use a camera with automatic exposure control if possible. Remember that there is usually plenty of light to use a relatively high shutter speed—at least 1/250 second—to avoid the effects of camera shake, even with a slow film. Techniques for taking pictures by remote control are covered in more detail in a subsequent article.

Becoming accomplished at photographing air sports is largely a result of experience. Once you have mastered the techniques you can accumulate an impressive collection of photographs. You may also find similar sports that are equally attractive—gliding, parachute jumping, sand yachting, windsurfing and other 'adventure' sports—the field is wide open.



David Hurn

There are not enough hours in the day for photographer David Hurn, for as well as carrying out his own assignments, he teaches photography at a college and works on prestigious commissions for top-flight magazines

In the last twenty five years David Hurn has established an international reputation for photojournalism equalled by few photographers. During this time every major feature magazine has published his work. His particular brand of humour coupled with a sensitive concern for his subjects has brought him a great deal of respect as well as financial success. Now in his mid-forties, he has made his base in the beautiful village of Tintern in Wales, close to the Abbey. From here he organizes a life which includes frequent assignments for *Life* magazine, *Stern* and *Geo*, as well as an academic career as head of photography at Newport College, Gwent.

David's first experiments with photography started while he was training to be an army officer at Sandhurst. He discovered that if he joined the photographic society he could wander about the camp more freely, as the darkroom was in a remote part of the building complex. When he realized that he would actually have to take some photographs he went out and bought a 35 mm Kodak Retina 3A to produce the three shots necessary for him to remain a member of the society.

'I was very lucky in a way because I didn't have anyone to teach me and what I've now discovered is that you either need to be completely self-taught, or you need to be guided by someone who is very good indeed.'

David began taking pictures around Sandhurst and what he saw through his viewfinder lead him to question certain assumptions behind army life.

'I suppose I would say we parted company by mutual consent. I think that they would rightly say that they chucked me out.'

After leaving the army, it was a short step to selling shirts in Harrods' department store, and from there on to Hungary to cover the revolution of 1956.

'I was very involved in politics then, and my excuse for going to Hungary in 1956 was to try and take pictures of what was actually going on. I bought two new cameras—well not exactly new—they were second hand Contax IIs, still one of the best cameras ever made. They had 35 and 85 mm lenses. I got an instruction book with them, so on the road I learnt how to use them and when I arrived in Hungary I simply shot pictures of everything that interested me.'

While in Budapest, David was approached by a correspondent from *Life* magazine who thought he was an

established freelance photographer. Soon afterwards, 20 year old David saw his first pictures appear in *Life*. About this time David admits that he was very naive about things like ownership of negatives and copyright. For the first few years of his working life he would simply post the exposed film direct to the picture editor of a magazine and never see it again. After processing and selection for publication, they were simply thrown away or filed. A great deal of David's early work has been lost and his famous shot of a one-legged freedom fighter was made from a duplicated negative which itself came from a single surviving print found in a dusty archive.

After his return to London, David worked regularly for a picture agency called Reflex. They specialized in candid pictures of the Royal Family long before this branch of photography became popular.

'We were the first agency to get the long 600 mm lenses and we'd spend all day reading the Court Circular and planning where the Royals were going to be, and chasing after them.'

Two notable scoops from this period were shots of the Duke of Edinburgh caught in a state of slight undress while changing for a polo match, and a unique shot of Princess Margaret with Peter Townsend.

'I took it from so far away that it wasn't possible to actually see who they were, but it allowed the *Daily Express* to say in the caption that they were in fact together. We got thousands of pounds for that shot.' It was not long before David tired of following the Royal Family and he got the chance to change direction when he was invited to shoot publicity material for a film being made in Spain.

While there, David met a Hollywood publicist called Tom Carlisle, who enabled him to do special assignments on dozens of films. David's greatest coup came when he was chosen to be Jane Fonda's exclusive photographer on the set of *Barbarella*.

'I was used for that film because, at that time, Jane was particularly difficult to work with, and Tom brought me in because I normally get on very well with women. Fortunately, it worked like a charm.' David's close friendship with Jane Fonda helped him establish an intimate relationship between camera and subject, and the fact that he achieved 125 magazine covers from these sessions speaks for itself.



David Hurn/Magnum

David has always tried to fashion a photographic style based on extremely simple equipment and methods. However, during this period he needed to master the problems of studio shooting with which he was unfamiliar.

'I just talked to a couple of friends about how to light a seamless white background, then I bought a three-head Bowens electronic flash unit and simply bounced the flash out of the umbrellas, two on the background and one on the foreground. Once set up I never changed it. It was just like shooting in daylight. Same cameras, all those covers were shot with Leicas and four lenses: the 28, 35, 50 and 90 mm. Keep it simple!'

David's paring down of equipment to basics allows him more time to concentrate on what he feels to be a really important part of special assignment or fashion photography, and that is getting models to look and feel relaxed.

'My method is to get people in front of me, to talk to them and set up the right kind of atmosphere. Once everyone is at ease we can get on with the work. One thing I learnt from assignments for *Harpers* and *American Vogue* was to use the same four or five models all the time. Being familiar with the models allowed me to work on my strengths and disguise my weaknesses.'

The 1960s was a very exciting time for European magazine publishing, with many papers bringing out colour supplements. And David's work—which was becoming more personal around this time—began to appear in a wide



David Hurn Shown here at work, David is renowned for creating a good rapport with his subjects, and his thoughtful, simple style

Woman and dog
In the early 1960s David did many fashion shots for prestigious magazines. This was for Harpers

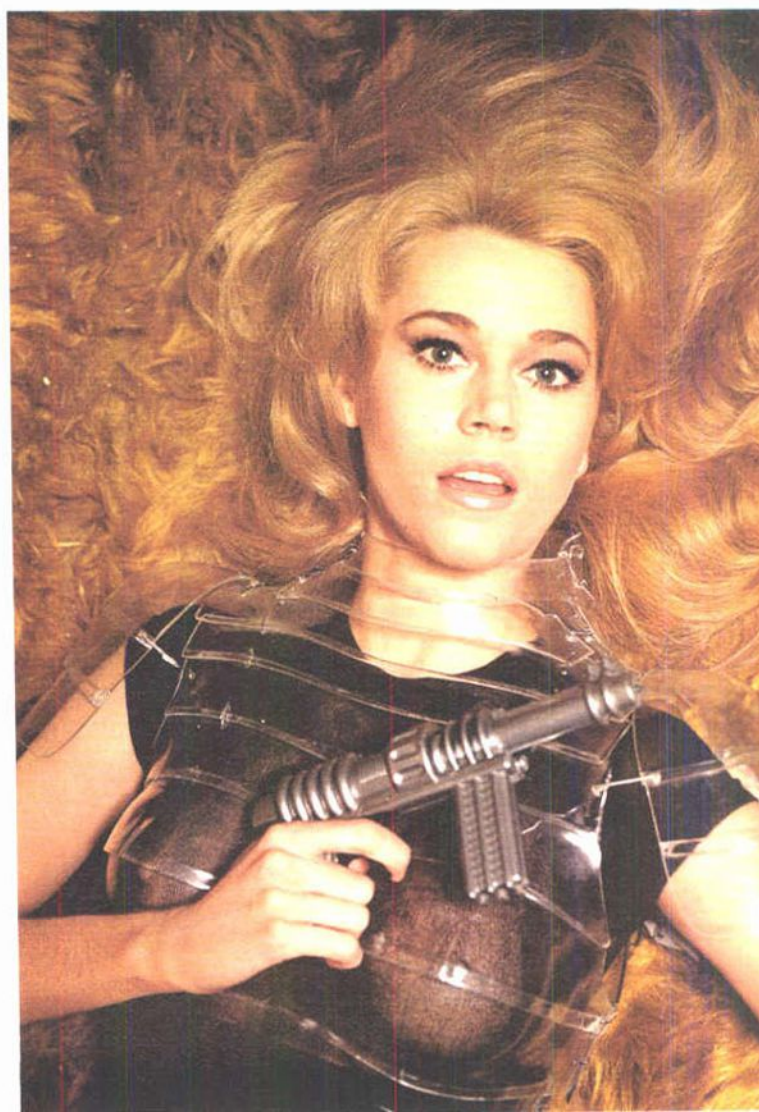
Arizona surfers
David liked the irony in this shot which shows a wave machine in a city that is surrounded by a desert



David Hurn/Magnum

range of publications, including the classics *Queen* and *Town*. He would concentrate on stories which on the surface seemed to be of minority interest such as hairdressing competitions, ballroom dancing, society events, strippers or the gay scene. All this was before minority rights became the subject of fashionable concern, but his powers of subtle observation tinged with irony were soon spotted by representatives of Magnum, the world's most exclusive photographic agency. Two of Magnum's

Barbarella
David worked with Jane Fonda, shown here, on the film as her personal photographer. This partnership resulted in over 100 magazines using his pictures of her for their front covers—a great tribute



founder members, George Rodger and Henri Cartier Bresson offered to sponsor David.

His acceptance into this prestigious photographic cooperative has given him friendly and rewarding contact with some of the world's best photographers.

One of David's worries is that an elaborate mystique has gathered around the basic principles of good photography and thus, he feels, can only obscure the truth and encourage amateurs to excuse sloppy results by blaming technical problems.

Discussing equipment, lenses and the latest emulsions has nothing to do with the taking of pictures. One of the problems most amateur photographers face is that they tend to be guided by other amateurs, and are drawn into the world of minor technology and chemistry which has absolutely nothing whatsoever to do with being a good photographer. 'Go and see any major mixed photographic exhibition and I challenge anyone to tell me, what film or developer combinations were used. Until you can do that, all such talk is a joke, just playing games.'

David's advice is to concentrate on a single type of film so that you become completely familiar with its characteristics and limitations. Once you have learnt the characteristics of a particular

Girl with flowers

A young girl plays in her own fantasy world—the sort of shot that David finds as interesting and challenging as an exotic assignment abroad. His careful composition lends the picture a delicate charm

Freedom fighter

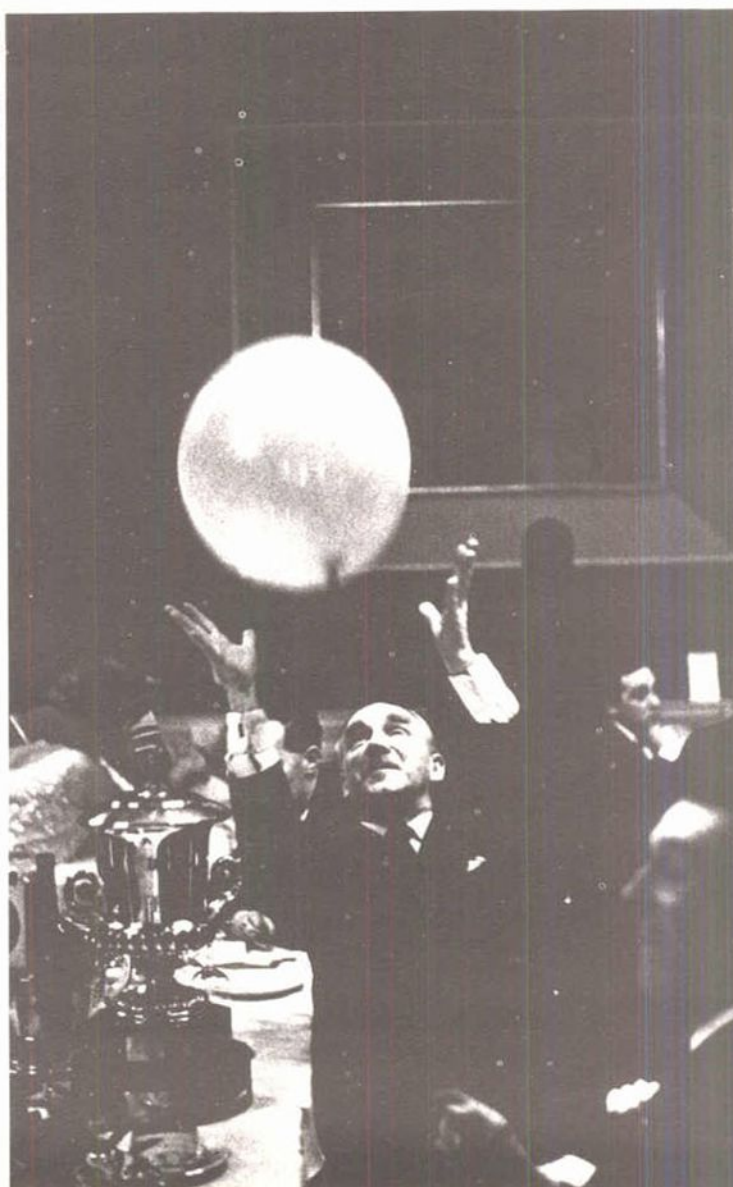
One of many shots that David took during the rising in Hungary in 1956, and one which helped him get his first big break when Life magazine used them for a feature. David was just 20 at the time

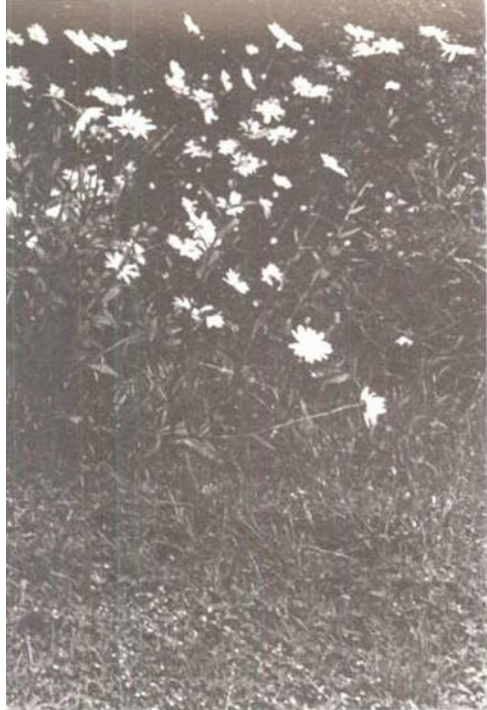
film, try to become equally familiar with your equipment. David believes he can always spot an amateur photographer by his constant struggling to focus. A professional knows his camera so well that he can focus approximately by feel before he has even raised it to his eye.

Because he wanted to see proper photographic information reaching a younger generation, David Hurn has accepted the enormous challenge of setting up a photographic department from scratch at Newport College in southern Wales.



David Hurn/Magnum





David Hum/Magnum

'I asked myself, "Is it possible to teach photography?" and eventually decided the answer must be "Yes", since it's a visual language, like painting. I find it interesting that all the best painters have been taught, while the best photographers are nearly all self-taught. Why are people taught to paint but not to take photographs? Because the best painters teach—most of them must to earn a decent living. If you're a good photographer you make a very good living, and the last thing you want to do is go back and make a poor living being a teacher!'

David has a completely new approach to photographic education, starting with the selection of students. Instead of looking at portfolios, David and his colleagues look for people who have many other interests. The idea is to use photography to expand their interests. Since it began in 1974, Newport's photographic department has established a worldwide reputation in the field of documentary photography. Every member of staff is a working photographer of high calibre and this, combined with a group of highly motivated and frequently mature students, has made the college very successful.

His income from teaching releases David from the pressures of finding money for ordinary living expenses and during the college holidays he has plenty of time to research and shoot stories all over the world.

'Now I have more time, I've managed to get back to a real amateur status—amateur in the sense that I no longer have to earn my whole living from picture taking, and also in its truest sense, of having love for the subject.'

Sheltering sheep An example of David's eye for the unexpected and the quietly humorous side of life. **Balloon** Incongruous images and people acting out of character frequently attract David's eye for a picture



One of his recent major stories came about after David read somewhere that Arizona was the worst state in America for infant mortality. This statistic fascinated him and, after some research, he discovered it to be based on 1962 evidence. The 1978 figure showed that Arizona had become the third best state for infant mortality. David saw the potential for a great story and began a six month research project that resulted in an astonishing series of pictures about saving premature babies. The pictures were later bought by *Life*, *Paris Match* and *Stern* magazines. The effort that he put into this project and his desire to avoid a superficial approach and find the truth, is typical of the way he works. He concentrates on just a few stories but

covers them in great depth.

David does all his own processing and, though he is sceptical of those who concern themselves more with technique than with picture quality, he is naturally keen to get the best results.

'One of the things I find incredible is people who are very picky about development temperature—but these same people use just any old thermometer that's lying around. If they did a test on that instrument they'd probably find individual variations of maybe two or three degrees. Those fluctuations can make a real difference between negatives.' As for print quality, he feels that the perfect print is 'the one where you don't think at all about the quality, you just think about the picture.'

Choosing a wide angle lens

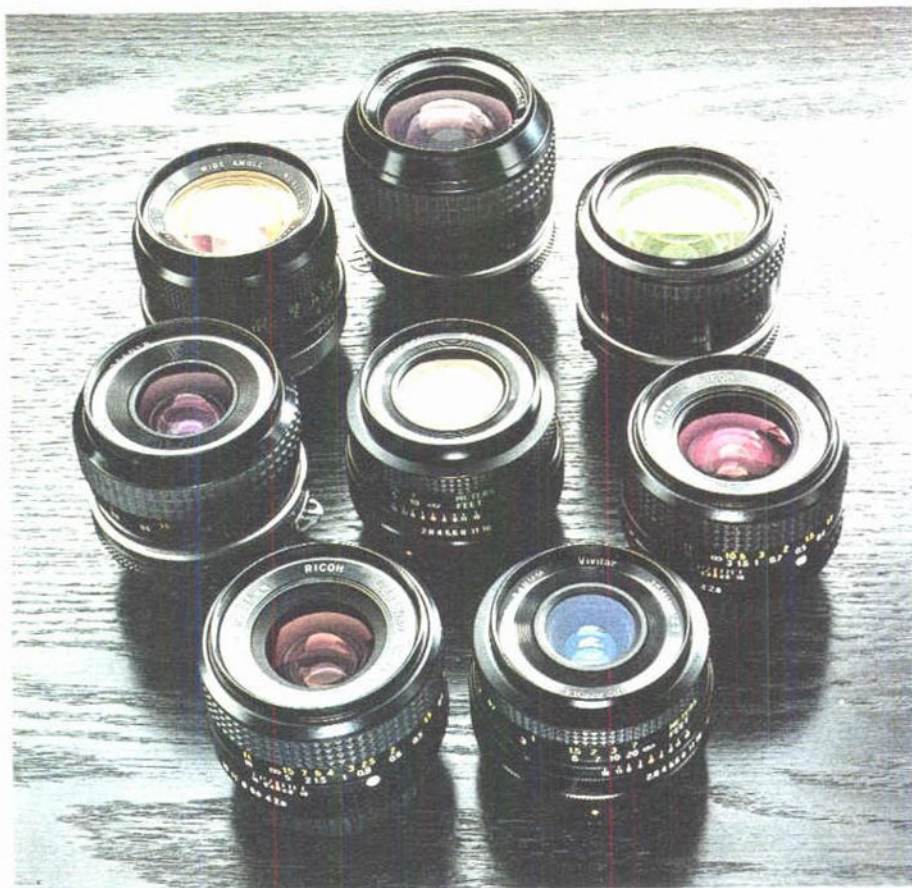
In tight situations, a wide angle lens is indispensable, but its usefulness need not stop there—because it produces a smaller image, you can get closer to the subject for more dramatic perspectives

Of all the additional lenses you can buy for your camera, perhaps few are more useful than a wide angle, and, increasingly nowadays, people are using a wide angle, not just as an accessory lens but as their main lens, in preference to the traditional 50 or 55 mm.

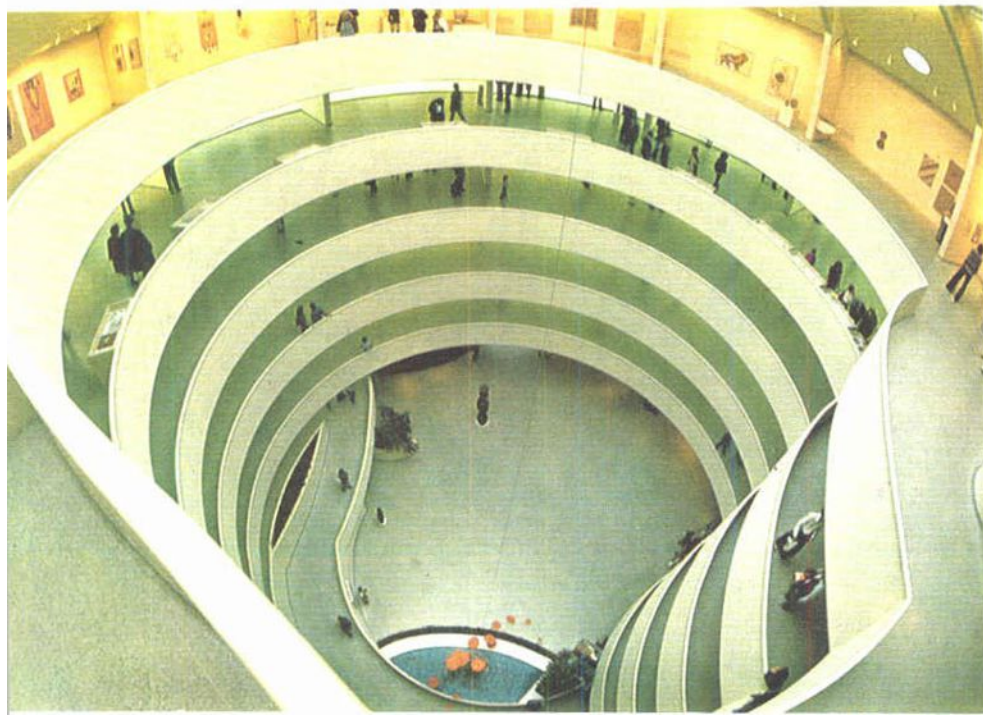
Giving that extra coverage to include all the subject and greater depth of field to ensure that it is all in focus, wide angles can be invaluable in many situations. An additional attraction is that you can shoot to include more than the main subject area and then crop at your leisure to achieve the desired framing. For close-ups, wide angle lenses can also give dramatic perspective effects.

Surprisingly, perhaps, the traditional 50 or 55 mm lens is actually a little too long to give completely 'normal' looking results on a 35 mm format: a focal length of about 43 mm is actually correct—this distance corresponds to the diagonal of the 24 × 36 mm frame. Some camera manufacturers already offer 38 mm, 40 mm or 45 mm lenses as options for standard lenses. If one of these focal lengths is not available for your camera, but you want to use a short focal length lens as standard, you could buy a 35 mm wide angle.

Wide angles of 35 mm are usually the cheapest wide angle in a manufacturer's range, and are often as small and light as a 50 mm. They usually take the same



Roger Payling. Lenses courtesy of Vivitar, Nikon and Ricoh

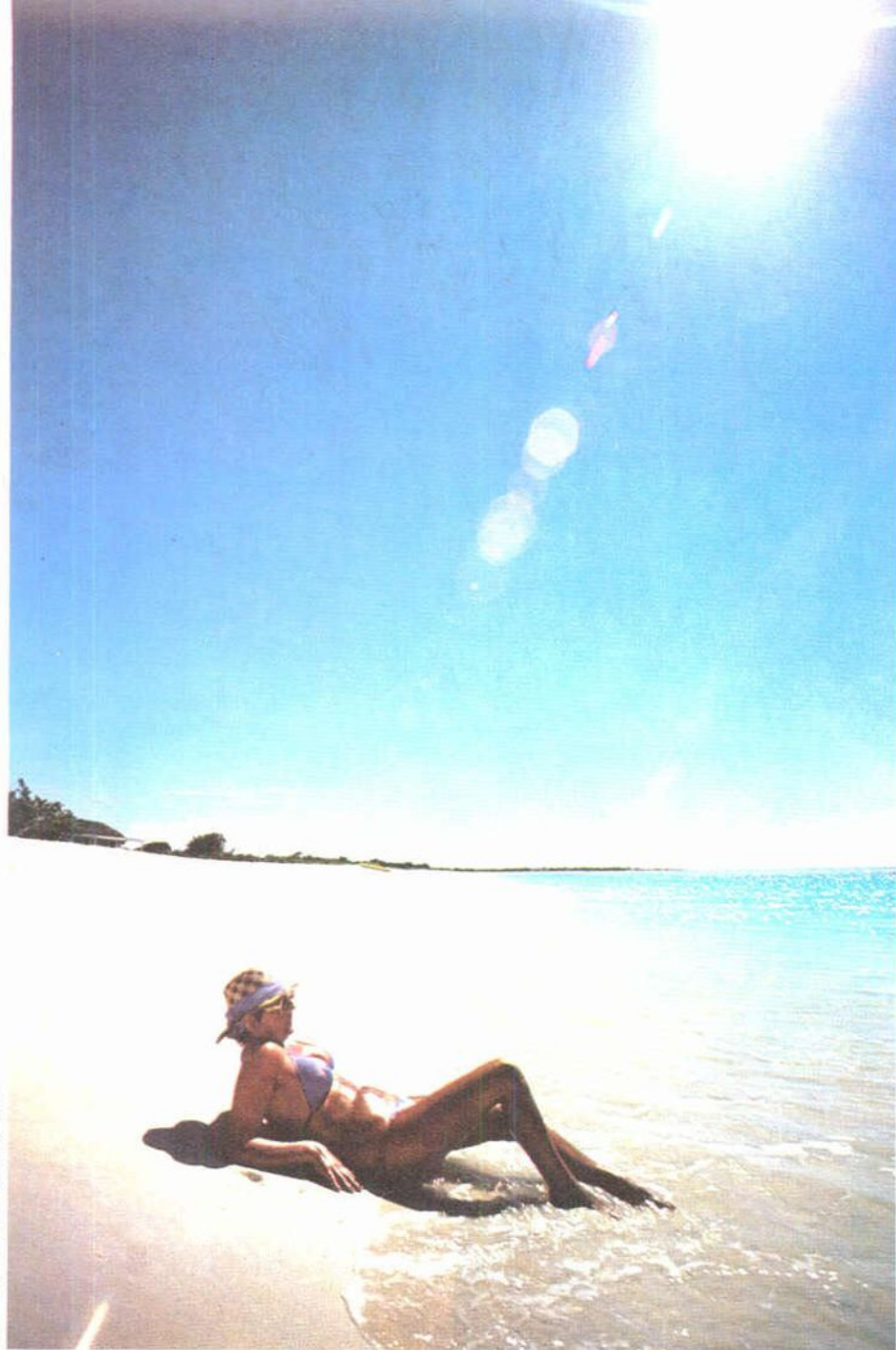


Wide angle choice Picking a wide angle lens is not easy. There are 150 different lenses which have focal lengths in the 24 to 35 mm range, and price is not always a guide to quality

Looking down The classic use for a wide angle lens is in a confined space. Here a 24 mm lens has been used to emphasize the curving spiral lines of the Guggenheim Art Gallery in New York

filtration attachment size, focus quite close, and even the cheapest usually give reasonably good results. Another point in the favour of 35 mm lenses is that they are easy for an inexperienced photographer to use—some of the more disturbing effects of wide angle lenses are not produced at this focal length.

The angle of view of a 35 mm lens just matches that of most flashguns at around 60°, so flash pictures will be



frame, perspective is very pronounced. Depth of field is also great enough to keep both foreground and background sharp, when properly focused.

This can be invaluable for news photographers who have to take pictures in fast moving, crowded situations where there is little time to focus the camera.

28 mm lenses are usually a little larger and heavier than standard 50 mm lenses, but are generally quite reasonably priced. This is because it is a popular focal length, and the lenses can be made in comparatively large numbers. Image quality is usually fairly good, but the optical performance of a cheap 28 mm lens is unlikely to be up to the standard of a similarly priced 35 mm.

24 mm lenses may seem only a little shorter in focal length than 28 mm, but the difference in angle of view is considerable. Pictures on a 24 mm lens seem to 'spread out' obviously at the edges and corners of the frame. Perspective also tends to be much more pronounced than with a 28 mm lens, because the photographer must move in closer to fill the frame with the subject.

The corners of the picture taken with a 24 mm lens are inevitably darker than the centre. This is not a sign of bad manufacture, but an inherent problem with wide angle lenses. All lenses suffer this loss of brightness towards the edge of the frame: it simply becomes more obvious at short focal lengths.

This combination of factors makes it easy to spot picture taken with a 24 mm lens—the photographs have a characteristic 24 mm 'look'. This 'look' can often

Sun, sea and sand Taken with a standard lens, this would have been just another beach snapshot. A wide angle lens takes in more of the sky, and a dramatic trail of flare spots lead to the sun

Fast or small Wide angle lenses that have a large maximum aperture tend to be big and heavy. These three lenses have a focal length of 35 mm, but range from $f/1.4$ to $f/2.8$

completely illuminated. With any wider angle of view, the edges of the picture may not be properly lit unless you use a diffuser to spread the light.

Because the angle of view is close to that of the standard lens, pictures taken on a 35 mm lens do not look like typical wide angle pictures—it is often hard to tell them from those taken with a standard lens. If you want to use the 35 mm as your standard lens, this is obviously an advantage. But if you wish your wide angle to supplement a 50 mm lens, the difference should be more marked and you may prefer a lens with a shorter focal length.

A 28 mm makes a useful combination when paired with a 50 mm standard lens, or one of the newer 40 or 45 mm standards. It covers almost twice the area of the 50 mm lens and gives the typical wide angle 'look'. Whenever any strong foreground objects are included in the



Roger Payling/Lenses courtesy of Nikon

be difficult to use effectively and it is probably best to avoid 24 mm lenses as your first wide angle, unless you are confident of your ability to exploit its characteristics. If you own a 24 mm and a 50 mm, you may find the gap between them uncomfortably large, and that you need a more moderate wide angle—like a 35 mm—to fill it.

Maximum apertures

All three wide angle focal lengths are widely available, with a choice of different maximum apertures from most manufacturers. Although very fast 50 mm lenses—lenses with a wide maximum aperture—are available, it is much more difficult to make a wide angle lens that has a really large maximum aperture. There are some mass produced fast wide angles which are very good value for money, but they cannot match the slow lenses for quality. Unless you can afford the best, avoid fast wide angles.

Down on the farm By showing both the horizon and the ground at the feet of the photographer, a wide angle lens lends itself to dramatic images



50 mm lens

Church in the trees A high wall in the churchyard prevented the photographer from backing away from the subject and, with a standard 50 mm lens, the tower top is lopped off. Using a 35 mm lens (right) cured this, and some photographers use this lens as standard. 28 mm and 24 mm lenses include even more of the surroundings



The most common maximum aperture for a 35 mm lens is $f/2.8$, though there are many $f/2$ lenses. Like the $f/2.8$ s, the $f/2$ lenses generally give good quality results, but they are physically much larger. There are a few lenses as fast as $f/1.4$ and even $f/1.2$ and this extra speed may be invaluable in low light conditions, but they do not give as good definition. At the other end of the range, there are a few $f/3.5$ lenses available at 35 mm but these are usually at the cheaper end of the market, and have a rather conservative specification by today's standards.

The typical 28 mm lenses are, like 35 mms, usually $f/2.8$ s, and there are many good quality $f/2.8$ lenses available at a reasonable price. There are several $f/2$ lenses in this focal length, but unless you pay extra for a good lens, performance may be disappointing. 28 mm lenses with a maximum aperture of $f/2.8$ also tend to be considerably more bulky and heavy.

Again, most 24 mm lenses have maximum apertures of $f/2.8$, though there are a few $f/2$ versions available. One manufacturer even makes an $f/1.4$, but this is both large and expensive.

As a general rule, then, any wide angle lens with a maximum aperture larger than $f/2.8$ tends to be more expensive, heavier, bulkier, and does not produce such good pictures as a lens with a more moderate specification. However, performance varies not only with the speed of a lens but also from manufacturer to manufacturer.

Lens faults

Although most wide angle lenses made by camera manufacturers are generally very good, some of the cheaper lenses made by independent manufacturers may have noticeable design faults. These



35 mm lens



28 mm lens



24 mm lens

faults fall into three main categories: 'barrel' distortion; uneven illumination; and focus fall-off.

Most wide angle lenses suffer 'barrel' distortion to some extent (see page 338) particularly with close-ups. With a few lenses, however, this can reach a level that you may not accept. Be careful not to mistake distortion produced by the lens with distortion that you see on some viewfinder systems, notably the Zenith E—viewfinder distortion will not appear on film. When checking for barrel distortion check the viewfinder first with a standard lens by focusing on a distant horizon. Then repeat the check with the wide angle in place. If the horizon bows up in the centre much more with the wide angle in place, it has barrel distortion.

Uneven illumination often occurs at full aperture and is partly cured by stopping down, but it cannot be totally eliminated. The poorer quality wide angles may suffer badly from this fault, but costly lenses are usually better.

Focus fall-off to the edges is another very frequent fault, as a wide-angle may tend to have curvature of field, an aberration which can mean a lens focused at one metre in the centre of the picture is focused at two metres at the corners. The best wide-angles have floating elements to correct this fault, which is normally worse at close focus distances and is absent, even in the cheapest lenses, at infinity. Floating elements make a lens very costly, and most lens-makers produce their lenses to give best results at around 3 metres. You cannot trust wide angle lenses to give a flat focus field for close-ups unless specially designed or corrected to do so—which most wide angles are not.

Making your choice

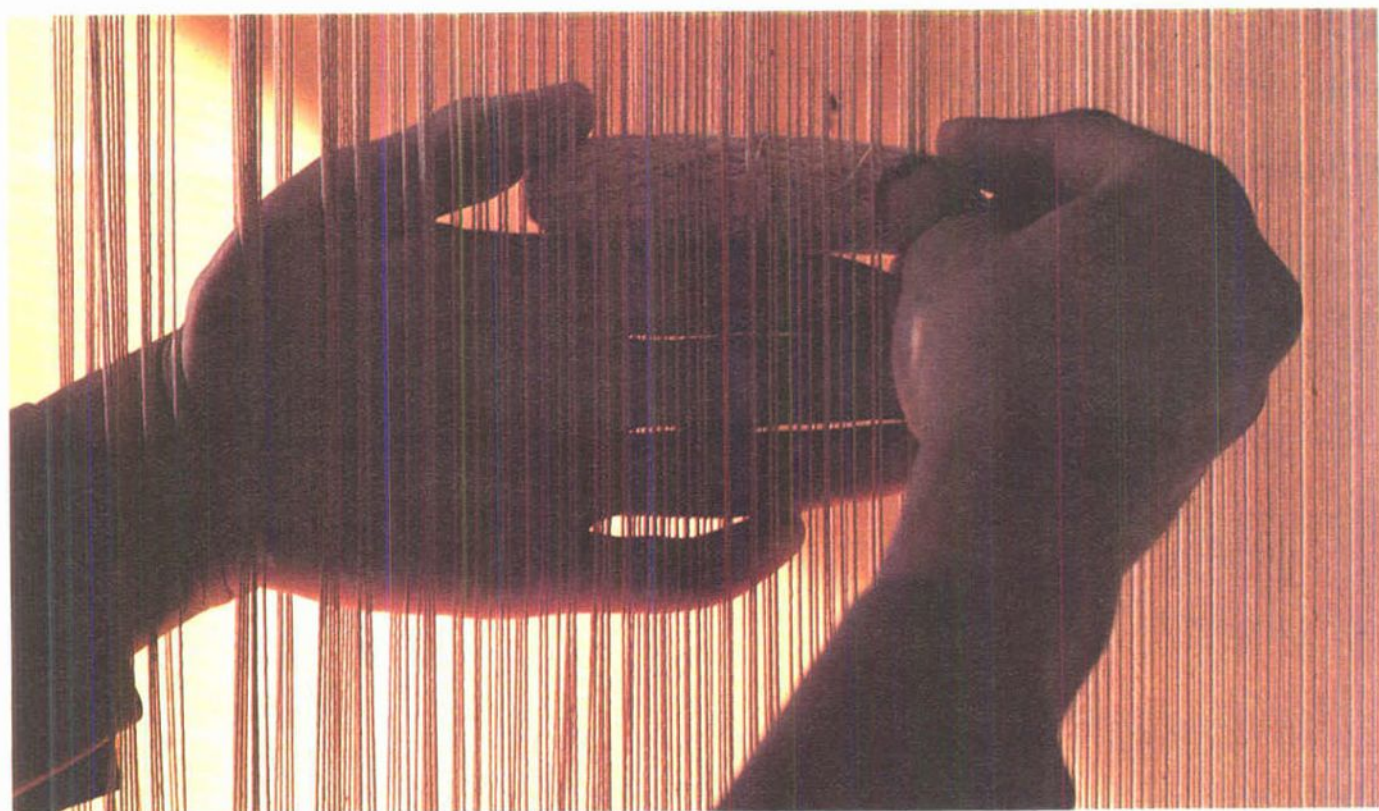
There are over 150 different lenses between 24 and 35 mm available, and it can be difficult to decide which to buy.

If you are buying a wide angle to use as a standard lens, then a 35 mm is most useful, but if you already have a 55 mm lens, a 28 mm is probably more suitable. A lens as short as 24 mm is only really necessary for very specific uses, or if you already have a more moderate wide angle, such as a 35 mm.

If you use colour negative film, and only produce enprints, then there is little to choose between different lenses. But if you enlarge or project your pictures, quality is an important factor. Remember that the lenses that have less ambitious specifications are likely to give better results than those that sound good to be true. For example, an $f/1.2$ compact 24 mm lens that weighs next to nothing should make you immediately suspicious. If you can afford to buy from a reputable manufacturer, then do so, because wide angle lenses are particularly difficult to design and manufacture. If you have a limited budget, avoid 24 mm lenses altogether and those with large maximum apertures—stick to an $f/2.8$ 35 mm or 28 mm.

Afghan carpetmakers

To photograph the intricate work of any type of craftsman you have to give careful thought to the nature of the work and the people involved so you give it sympathetic treatment



Throughout the world, craftsmen in different countries have been passing on their skills through the generations, and the traditional tools, materials and methods used in many crafts have remained unchanged for centuries. The English saddle maker's work featured on pages 630 to 631 is one aspect of this, but half way across the world, in Afghanistan, the picture is very similar.

The photographer, though, cannot simply approach all types of craftwork in the same way: different photographic activities demand different photographic approaches, and to make a successful record it is vital to respond to the material in a thoughtful, careful way.

Like all aspects of Afghan life, the traditional crafts have been threatened by the recent troubles there and the ancient activity of carpet weaving has become disrupted as the war breaks up the old family-based industries. Photographing the process of making a carpet and its social background is a subject particularly suited to the camera, as far as accurately recording lasting images of vanishing art is concerned.

Judah Passow is an American photo-journalist who has covered a wide range of stories all over the world. He travelled to Afghanistan to cover the war but became particularly intrigued by the

Hands at work Judah used a 105 mm lens to isolate the pleasing textures and shapes involved in carpet weaving

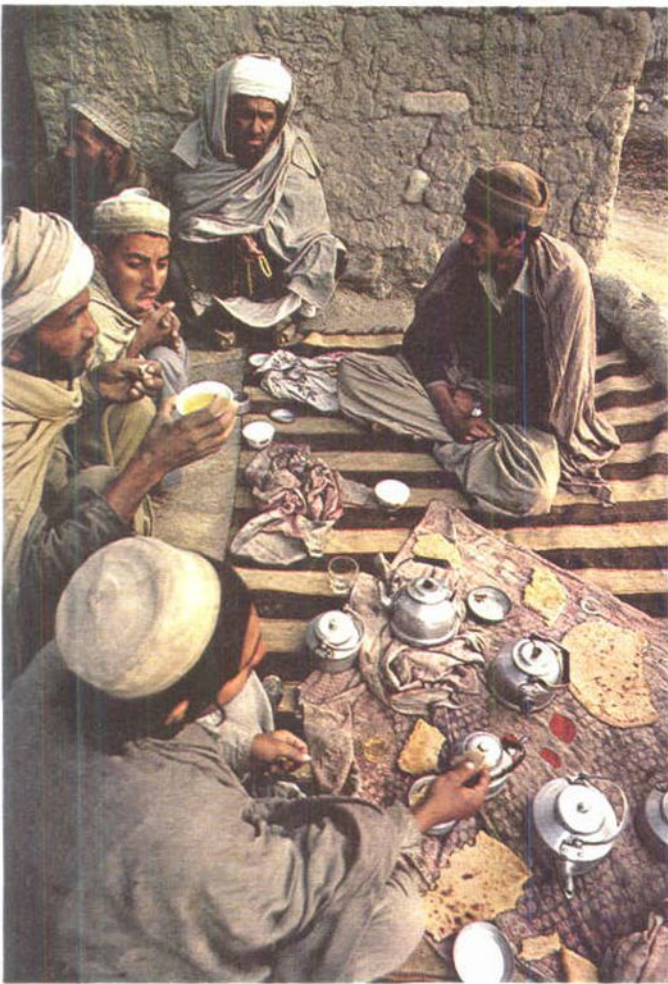
Antique rug To show the craftsmanship of this 600 year old silk rug, Judah moved in so it filled the frame



more creative aspects of Afghan life—the carpet makers in particular.

Behind the doors of the craftsmen, Judah found warm, friendly people who were only too happy to allow themselves and their work to be photographed. The process of carpet making involves



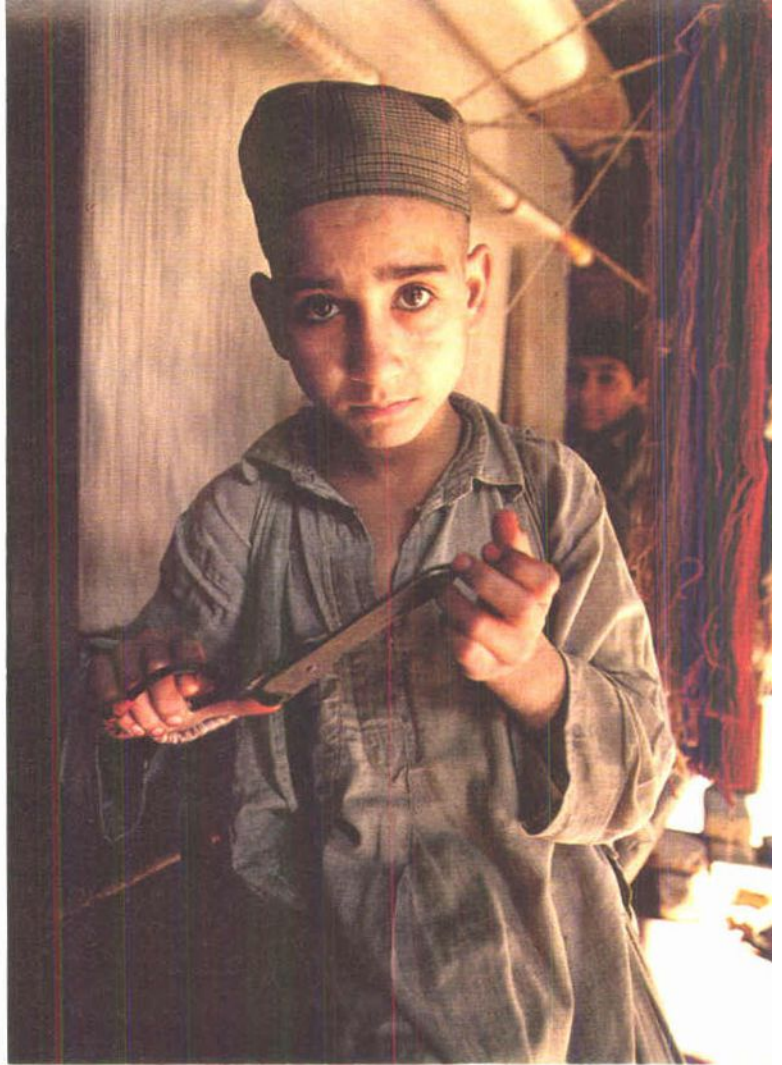


Meal time Carpets are important features of all Afghan life—another point Judah showed with his camera

members of the family of all ages and Judah was careful to take photographs that emphasized this social element of the process. This differs from the treatment Victor Watts gave to the saddler who mainly works alone or with an apprentice

For all of these shots Judah used either 24 or 105 mm lenses on his Nikon F2 bodies. Using available light made the photographs more spontaneous and atmospheric, but with the relatively slow film—Kodachrome 64—Judah found he had to select slow shutter speeds of

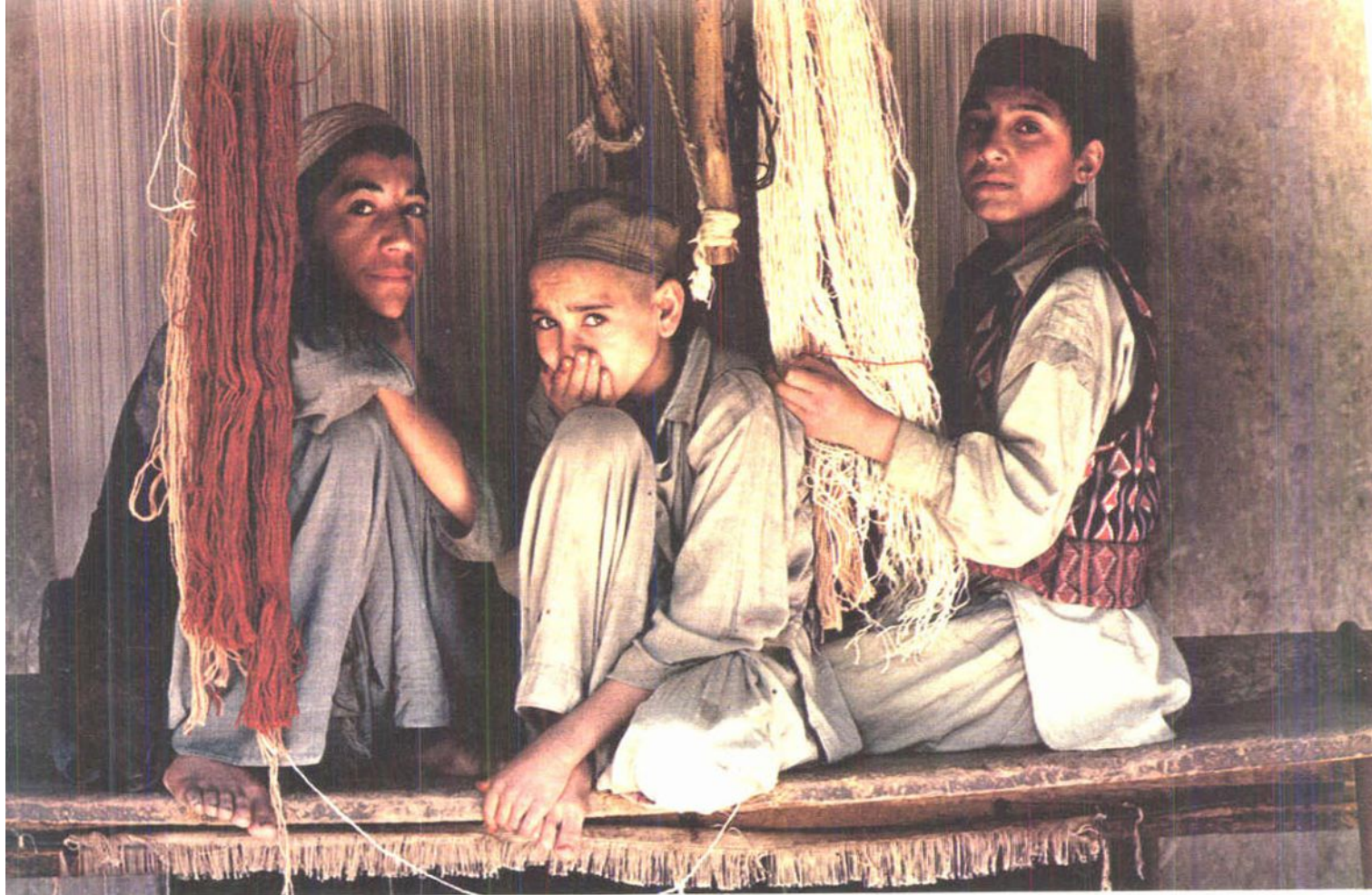
about 1/15th to 1/60th second. This also meant dealing with limited depth of field so Judah was always sure to focus carefully on the most critical area of the scene. For instance, with the portraits, Judah focused on the eyes—usually the most important photographic feature of



Young worker Children of all ages are involved in this work and provided excellent subjects for portraits



Judah Passow Network



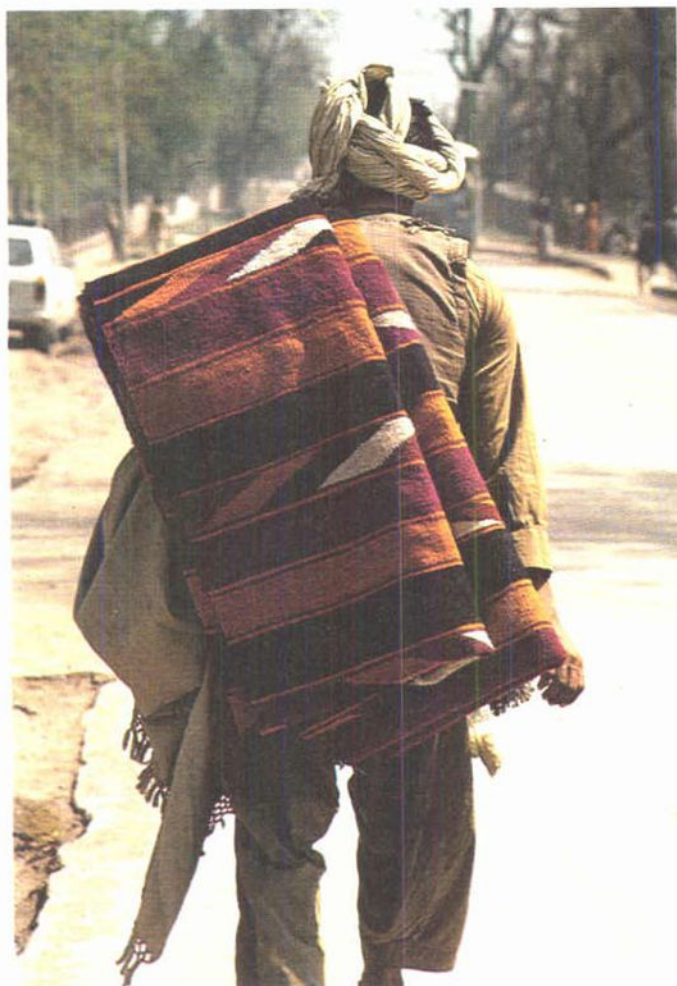
Three children
Judah also showed
the children with
their work

Carpet salesman
For variety, Judah
sought associated
facets of the work

A new tool
A symbol of the
threat to the
old way of life

a face. For other shots, the hands of a worker or the blade of a tool gave Judah his focusing point. With the limited depth of field caused by using slow film in low light, careful focusing was absolutely essential.

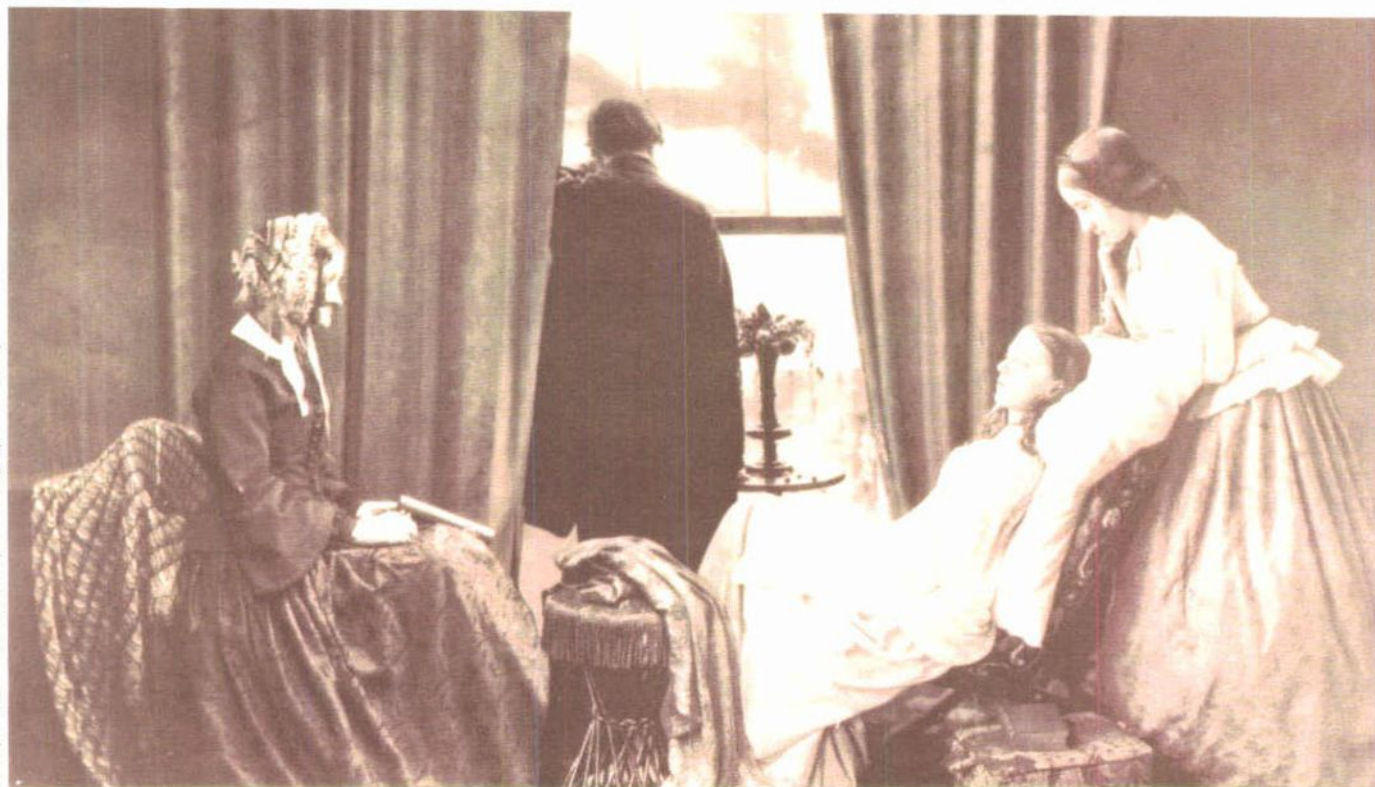
Judah always finds a straightforward documentary approach is more revealing than candid photography for work of this nature. Even though few of his subjects were aware of the full implications of what he was doing, they were only too willing to please a stranger



The rise of a new art

Although photography started as a means of documenting places and events it soon began to be used as a way of expressing artistic ideas. This began the long debate on photography as an art form

Henry Peach Robinson/Royal Photographic Society



Fading Away When Robinson exhibited this composite picture in 1858, it marked the beginning of his success as a pictorialist photographer

In the early days of photography, photographers were more concerned with getting their equipment to work properly than with their approach, and early photographs tended to be basic portraits and local scenes. But by the 1850s, the technology of the camera had progressed so far that photographers were free to start thinking about their subject in new ways. Some photographers began to see photography not simply as a technical method for making accurate visual recordings but as a new art form.

Naturally, this view raised a good deal of controversy—a controversy that is still alive today. Many members of the Art Establishment were convinced that it was impossible to put any artistic and creative intelligence into a device that simply recorded the scene before it. They had, no doubt grudgingly, accepted that the photographer could compete with the painter in producing likenesses—as the number of out-of-work portraitists testified—but they could not see photography as true art.

Perhaps unsurprisingly, many photographers went along with this view to start with and regarded themselves as craftsmen and technicians rather than artists. Two of the few exceptions were a pair of Scotsmen, David Octavius Hill

and Robert Adamson. The combined talents of Hill, a painter, and Adamson, a technician, were ideally suited to photography and between 1843 and 1848 they produced several thousand superb calotypes of many subjects. J. E. Mayall's daguerreotypes illustrating the Lord's Prayer also encroached on the boundaries of art. However, such examples were rare before 1850.

With the major technical improvements of the 1850s this situation changed. To show that their medium was as flexible as painting—that the artist did have some control—photographers began to try manipulating their images by hand-colouring, especially of portraits, and by combination printing, where two or more separate negatives were combined to produce one print. Combination printing was used to great advantage by the French photographer, Gustave le Gray who took separate negatives to improve sky detail in his seascapes (see page 415). The most influential development was the wet-collodion process perfected by Scott-Archer in 1851.

With the arrival of the wet-collodion process and other new techniques, photographers began to appreciate the potential of their medium and many were determined to show that photography could be considered as fine art, in both its control and execution and its subject matter. Their determination was increased by the inevitable drop in standards that came as more and more people jumped on the photographic bandwagon.

They began to look for ways of consolidating their position. Art had a defined institutional structure with schools, societies, exhibitions, journals and patronage dating back many centuries. Photographers decided to form their own and the 1850s saw the first exclusively photographic exhibitions, the publication of books on manipulation in printing and the founding of *The Photographic Society of London* (later *The Royal Photographic Society*) and the *Société Française de Photographie*. At the same time, the market for photographs expanded tremendously—sales went up and wealthy patrons began to sponsor photographers as they had done artists.

All these developments were viewed at first with interest and then alarm and

finally anger by many artists. They were suspicious of the capabilities of photography as a 'machine craft'.

At the same time the influence of the realism of the photograph was already showing in the work of such painters as Corot, Delacroix and the French portraitist Ingres who stated: 'It is to this exactitude that I would like to attain. It is admirable—but one must not say so.'

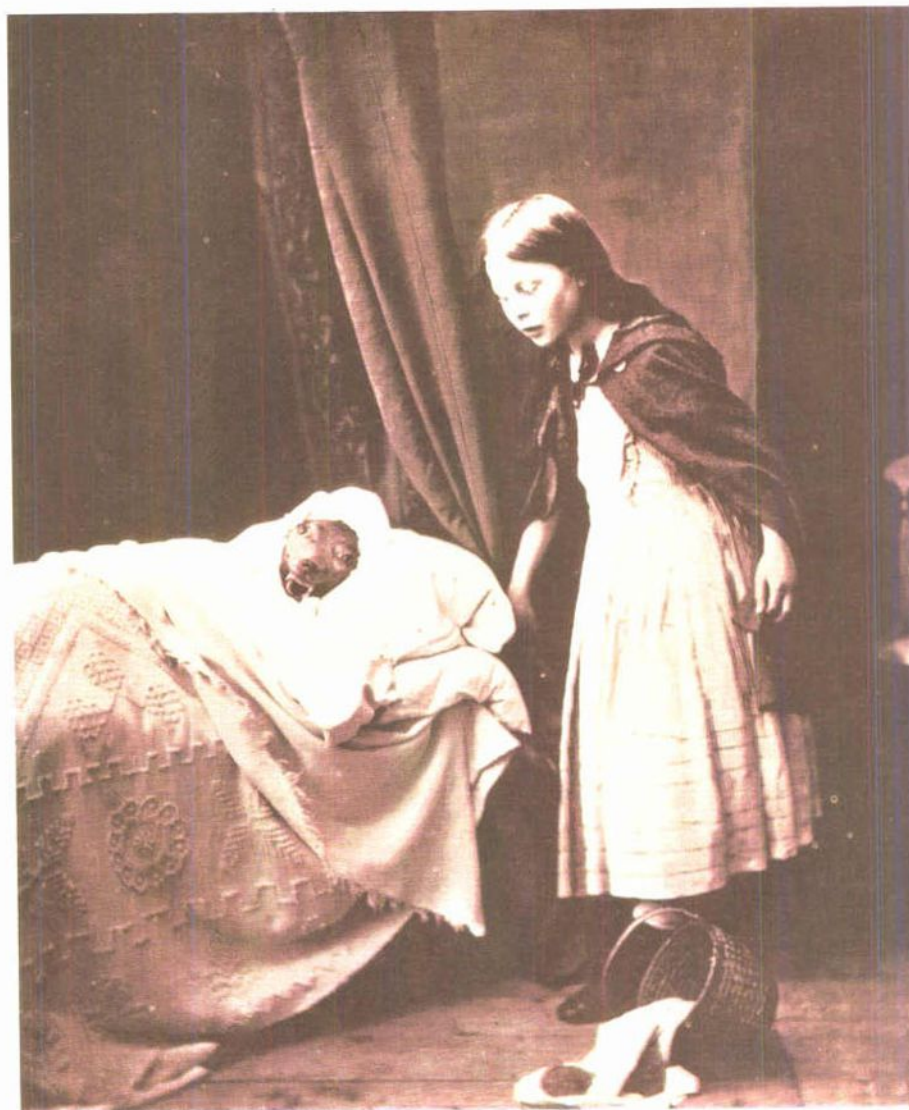
Many artists, however, were not so impressed—those that had been striving for realism seemed suddenly redundant, and initially unable to find a new role, they attacked their usurper with a vengeance.

Others accepted photography as an aid to their own work, but could not see it as an art in its own right. A few took advantage of the photographs to provide information for their paintings but would not admit that they had the fear of criticism that their paintings looked too much like machine-made images.

Although the strength of photography was that it showed nature in all its detail, this was also the greatest obstacle to its acceptance as an art form. People felt it showed too much without selection, giving equal importance to everything within its range. Some critics thought that this was in the artists' favour, as it returned them to the higher concerns of art, as opposed to mere description.

Others were less favourably disposed to it. In Baudelaire's review of the first annual salon of the French Photographic Society, he wrote: 'I am convinced that the ill-applied progress of photography has contributed much, as indeed do all

Confessions (below) Taken in 1887, this shows Emerson's much more naturalistic approach to portraiture



Henry Peach Robinson: *Victoria and Albert Museum*



Peter H. Emerson/Mansell Collection

Julia Margaret Cameron/Mansell Collection



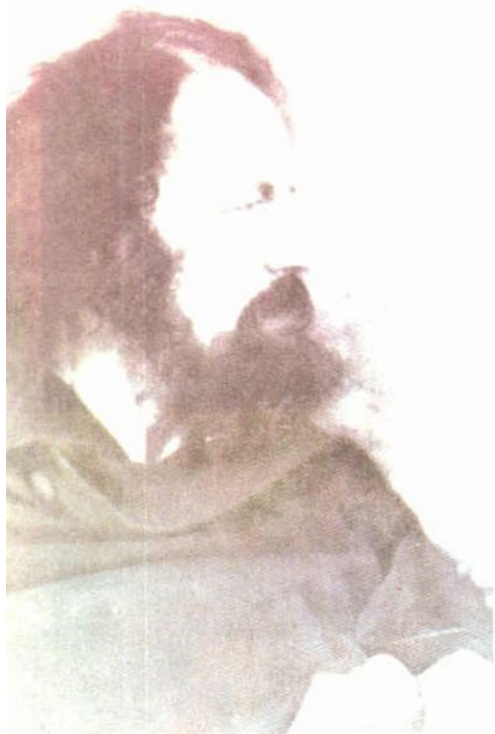
Oscar G. Rejlander/Royal Photographic Society

The Two Ways of Life *Rejlander began the vogue for pictorialism with this allegorical composite picture in 1857*

Little Red Riding Hood (left) *Another very contrived example of pictorialism made by Robinson in 1862*

Harvest field *Emerson preferred to be realistic and rejected the theatrical poses of the pictorialists*

Alfred Lord Tennyson *The poet called J. M. Cameron's portrait of him 'The Dirty Monk'. It was taken in 1865*



Peter H. Emerson/Victoria and Albert Museum

purely material advances to the impoverishment of French artistic genius already so rare (1859).

The criticisms levelled against photography were also confused by a frequent failure to distinguish between different kinds of photography. To decide about photography's status as art, distinctions must be drawn between photography as a direct record of natural things and its use to reproduce the works of others. Then, as now, a variety of work was being produced.

One of the most important approaches to photography at this time was *pictorialism*, where the primary intention is to present a pleasing image—Peter

Robinson, Julia Margaret Cameron and Dr Emerson were all pictorialists. Another approach was the tradition of portrait photography, where artistic merit was a combination of the photographer's talents and the inherent interest of an often famous sitter, as in the work of Nadar and Etienne Carjat in France.

A third approach was to photograph works of art to make them more widely appreciated. Roger Fenton's photographs of the British Museum treasures are a particularly good example of this approach. And finally there is the whole range of documentary photography. Documentary photographs were origin-

ally produced to convey precise information, but many have since been reconsidered and may be appreciated for other artistic qualities. Photographs of all these kinds were produced between the 1850s and the 1890s and encountered various kinds of support and resistance.

The first notable pictorialist was a Swedish portrait painter turned photographer called Oscar Gustav Rejlander. In 1867 he exhibited a large photograph called *The Two Ways of Life*. This was an allegorical composition showing the alternative life-styles of morality and depravity, and was partly intended to show that photography was more than a purely mechanical art. The photograph was based on preliminary sketches and the final combination print was assembled from over thirty negatives.

Rejlander thus showed that photographs could easily be manipulated, and that photography could—like painting, handle complex themes. The resulting picture was very well-received, particularly after Queen Victoria set a standard by buying a copy for ten guineas.

A year after Rejlander exhibited this picture, another painter turned photographer, Henry Peach Robinson, exhibited his first combination print, *Fading Away*, showing a girl dying of consumption. With these pictures Robinson and Rejlander established a



Alice Liddell and her sister Carroll, a gifted amateur, took many slightly coy pictures of young girls

Stereoscopic portrait Made for viewing through a special viewer and hand coloured for a realistic effect

Lewis Carroll/Mansell Collection



By courtesy of The Kodak Museum, Harrow

Viscountess Hawarden/Victoria and Albert Museum

movement in pictorial photography which was to last for over thirty years.

They used combination printing as a means to explore the artistic possibilities of photography. Their main concern was to achieve breadth of effect. Reality was not so important to them.

At the same time as these photographers were using more complicated techniques to reproduce nature within the studio, painters were moving out of

the studio and simplifying their techniques. Many of them therefore reacted strongly against the work of the pictorialists, which they considered artificial.

Nowadays the pictures produced by the pictorialists seem even more artificial and over-sentimental. In their day however, they had a tremendous influence. Robinson's elaborate illustrations of poetry and his books on 'pictorial photography' were received with

great enthusiasm by an eager public.

Over-sentimentality and artifice also marred some of the work of another remarkable Victorian photographer, Julia Margaret Cameron. In spite of this, her photographs are considered to be amongst the most satisfactory of the era. She is best known for her portraits of *Famous Men and Fair Women*, but she also photographed a variety of other subjects, including illustrations for Tennyson's *Idylls of the King*.



Frederick H. Hollyer/Victoria and Albert Museum

May Morris Hollier's portraits were strongly influenced by the romantic attitudes of the Pre-Raphaelite painters



Lady at her dressing table Another gifted amateur, Lady Hawarden took a number of charming portraits of women

Nude The use of such photographs as studies introduced a new reality to painting in the nineteenth century

As a gifted amateur she was free to pursue her own interests and developed a highly individual style, producing deliberately out-of-focus photographs which tried to capture 'the soul' of her subjects. Unfortunately she also neglected the technical aspects of her work, so that clumsy artifice or manipulation sometimes undermined the artistic effects she was trying to achieve.

Mrs Cameron showed little regard for the mass market or for existing 'art' photography, which she despised. This alienated her contemporaries, especially Robinson and his followers, but found favour in the art community.

Talented amateurs like Mrs Cameron often proved to be successful photographers. Lewis Carroll, for example, produced a number of charming photographs of young people, especially young girls like Alice Liddell, the original Alice of his novel *Alice in Wonderland*. Lady Hawarden's pictures of young women were charming examples.

Throughout the 1870s and 1880s, pictorialism continued to dominate 'art' photography, but the conflicts between Art and pictorialism increased. Art critics encouraged photographers to attempt and exhibit painterly themes and then criticized the work for being too 'photographic'. At the same time, painting was beginning to be judged by the realistic standards of photography while photography was judged by the imagination of painters. As a result both practices suffered.

There was increasing dissatisfaction with the contrived picture-making of the day with its grand themes and lack of originality. Then in 1886 the American Dr Peter Henry Emerson addressed the London Camera Club on the subject of *Photography and Pictorial Art*. At this meeting Emerson put forward a theory of 'naturalistic' photography that was diametrically opposed to the elaborately constructed work of Robinson and his pictorialist group.

Emerson believed that photographers should work within the limitations of the medium rather than imitate other art forms—a very original idea at the time. He also denounced the overall sharpness of existing 'art' photographs as he felt that Nature should be represented as it was perceived by the human eye—with the focus gradually falling off from the central point of interest.

He later illustrated his ideas with a portfolio of 40 prints showing *Life and Landscape on the Norfolk Broads*, published in 1886. It was the first of several volumes on the people and landscapes of East Anglia.

Emerson's ideas polarized the photographic world in the late 1880s. The central controversy was no longer art versus picture-taking. 'Art' photographers were now divided amongst themselves, and a new school of artistic photography developed which was oriented towards an emotional relationship with its subjects rather than an obviously manipulated pictorialism. Emerson's ideas also prompted an increasing use of soft-focus—a movement which he did not support. This too contributed to the discussion about the nature of art photography.

The period of 1850-1890 was thus a very significant one for art photography although many of the issues were left unresolved. During this period many other visual artists benefited from the debate and, like the French Impressionists, began to use elements of photography's visual style in their own work. Photographers, however, had become entrenched in battle and it was not until Emerson came onto the scene that they began to realise the unique qualities of their own medium.

Emerson's example prompted a re-appraisal of photography that was to lead once more to new societies, new processes of manipulation and new encroachments on the traditional areas of the art world.



LeCadre/Bibliothèque Nationale, Paris

Improve your technique

Pictures by artificial light

Colour slide film is particularly sensitive to the colour of the light falling on the subject, and indoors what your eye sees and what the film records may be very different



To the human eye, colours tend to look much the same in every light—a red pen is red and a blue pen is blue in both daylight and electric light. But there are significant differences in the colour of every type of light source, and an object that appears one colour in fluorescent light is a slightly different colour by candlelight. While the eye quickly adapts to changing light and may not see these colour variations, they may be only too obvious on film unless you make appropriate adjustments.

Earlier articles show how to correct for variations in the colour of daylight (see pages 429 to 431), but it is just as important to correct for the differences between various types of artificial light otherwise your pictures may turn out with an unpleasant colour cast.

Shop interior Film colour balance need not always match the light. Daylight film was used here to good effect with the warm predominantly tungsten lighting

Good colour balance is particularly crucial if you are using colour slide film because it is virtually impossible to adjust the colour during processing. But even with negative film, it is worth trying to get the colour correct when you are taking the picture—if the colour is nearly correct, filtration for printing will be that much easier and if the colour is too far out, it may be impossible to correct even with the strongest filters.

Techniques for colour correction of artificial light sources are, like those for daylight, relatively straightforward, consisting largely of matching the film to the

light source as closely as possible and making further adjustments with filters placed over the lens. With artificial light photography, however, you have additional scope for correction because you can often adjust the light source. You may be able to change the light source completely, or adjust its colour with the aid of filters placed over the bulb or reflector.

The problems with colour correction of artificial light come in deciding what correction needs to be made. It is essential, therefore, to identify your light source or light sources. Beware of mixed light sources, though. If you are shooting indoors, for instance, daylight may be coming through the window and mixing with the electric light. Mixed lighting should be avoided if possible.

For indoor work, there are four major types of light—tungsten studio lighting, domestic light bulbs, fluorescent light, and flash—though there are many others such as candles or gaslamps. Artificial light outdoors, however, is much more varied and often hard to identify. Street lamps differ and may use, for instance, sodium, mercury vapour, tungsten, gas, or oil. Only once you are sure of the type of light source can you begin to make corrections for the type of cast they give.

Tungsten studio lighting

Like many forms of artificial light, tungsten studio lights—such as photofloods and 'photographic' lamps—produce a light that looks almost as white as daylight but in fact has a much lower colour temperature (see page 220); that is, it has a much lower proportion of blue. Pictures taken in tungsten light on daylight balanced slide film, therefore, have a rather orange cast.

The orange cast from tungsten lighting can be attractive, giving a warm cosy look to the scene and adding colour to skin tones, and you may not always want to correct for it. However, in most circumstances the cast is much too strong and must at least be partially corrected.

Perhaps the simplest correction to make is to buy film balanced for certain kinds of studio lighting. Both colour slides and colour negative films can be bought in versions that are balanced for tungsten studio lights. Colour slide films for studio lighting are normally referred to as Tungsten or Type B films; the colour negative films are usually referred to as Type L. Both these films are designed to give the correct colour balance with photographic lamps at 3200K. These films give fairly good balance with most tungsten studio light and you will rarely need to make any other corrections.

If for any reason you wish to use daylight balanced film, you must use filters. You can place filters over the lights, but if all your studio lights are similar it is far easier to use a filter over the lens. Unfiltered, daylight slide film gives a very orange cast, and to correct you must use a deep blue filter, such as the Kodak Wratten 80A.

Unless you have TTL metering, you must remember to make the necessary exposure adjustments whenever you add a filter.

For nearly all your studio shots, either tungsten balanced film or daylight film with an 80A filter give good results, but there are times when you want the colour balance absolutely perfect. On these occasions you may have to make further adjustments.

First, you must discover what colour temperature your lights run at. Photographic lamps are normally rated at 3200K and may need no special treatment, but photofloods are slightly bluer and are rated at 3400K. So, when using photofloods, many photographers would

recommend a pale pink 81A filter to remove the blueness with tungsten film, or an 80B filter with daylight film.

Unfortunately, even this extra care does not ensure perfect colour because the lights cannot be relied upon to stay at their rated colour temperature. Manufacturers of photofloods, for instance, only guarantee that their lamps are within 100K of 3400K, but no closer. Even if you could buy a perfectly rated bulb it would have to be run constantly at the correct voltage. Unfortunately, most domestic electricity supplies vary noticeably in voltage from time to time. You can buy special voltage stabilizers, but these tend to be very expensive.

The colour temperature of studio lamps also varies with their age—photographic lamps, in particular, tend to redden as they get older. Again, you can buy special intensifiers that increase the voltage to maintain the colour as the bulb gets older, but these are an unnecessary expense for the amateur. A final point to remember is that colour temperature also varies with how long the light has been on.

There is little you can do to overcome these variations unless you have an expensive colour temperature meter, but you can keep them to a minimum by taking certain precautions. First, avoid plugging any other electrical appliance into the socket that supplies your lights. Second, whenever you buy new photographic lamps, let them burn for 15 to 20 minutes before you take any pictures because when new they are slightly bluer than the rated 3200K. If you can

afford to, it is also a good idea to replace bulbs after five sessions. But there is no need to discard the old lamps altogether; they can be used for black and white work with good results.

If you take these basic precautions, and make the adjustments recommended above, there is no reason why you should not achieve good if not perfect colour balance on every shot. Problems only arise when you get reflections from strongly coloured surfaces. Keep your subject well away from such strong colours unless they contribute positively to the image.

Normal domestic lighting, however, may be slightly harder to deal with.

Domestic lighting

The problem with average domestic lighting is that it can take so many different forms. Although it is normally in the form of tungsten bulbs, these can be anything from 15 watts to 200 watts and upwards. Each wattage gives a different colour temperature—a 25W bulb, for instance, gives out a light of about 2600K while a 200W bulb may work at about 3000K. Colour temperature varies between individual bulbs of the same wattage even more than it does with photofloods.

If you are working at home, colour temperature may also be affected by the colours of the furnishings and decoration, and the colour of the lamp shade.

With all these complications, it is clearly impossible to achieve perfect correction. Fortunately it is rarely needed. People are used to wide variations in the colour and appearance of domestic rooms and so will not usually be upset by minor colour casts. In fact, an orange colour cast may actually give an attractive warmth to the picture.

Nevertheless, if you want your pictures to look fairly natural, you must make some sort of correction. Domestic tungsten lighting is very yellow, so when correcting you should aim to reduce the yellow content. Using tungsten film or daylight film with an 80A filter will eliminate most of the yellow and in many instances this will be adequate.

If results are still too yellow, however, you may have to use an 82A filter with the tungsten film. You could use the 82A in combination with 80A and daylight film but two filters restrict the amount of light reaching the film considerably and you may need inordinately long exposures to compensate. If you do decide to use to use a combination of filters, it is best to use gelatin filters because they are much thinner and will have less optical effect on the film.



Boardroom Tungsten balanced film was used in daylight to give a cold blue cast. But a desk lamp directed on the face improved skin tones

Fluorescent lights

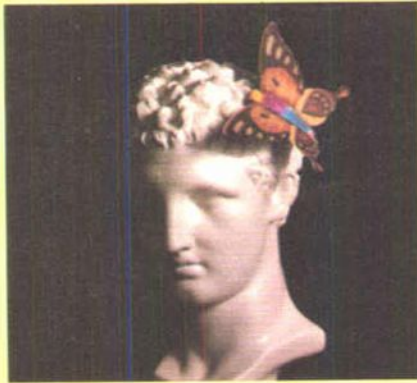
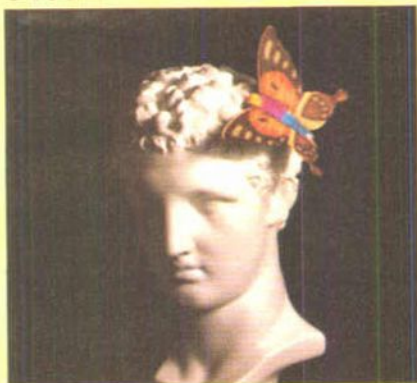
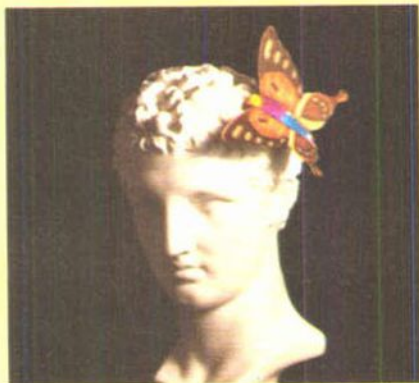
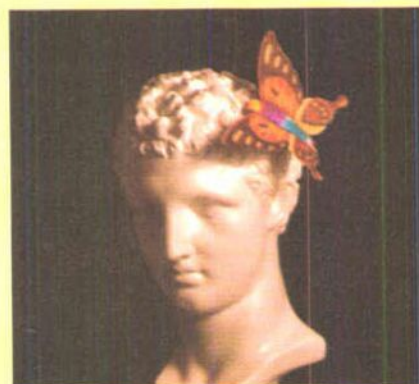
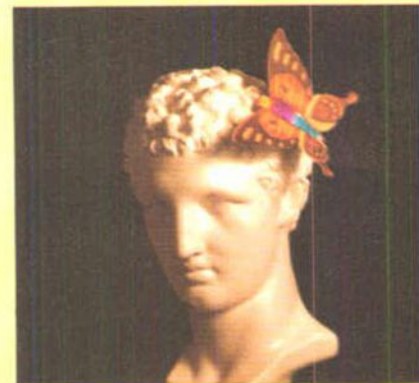
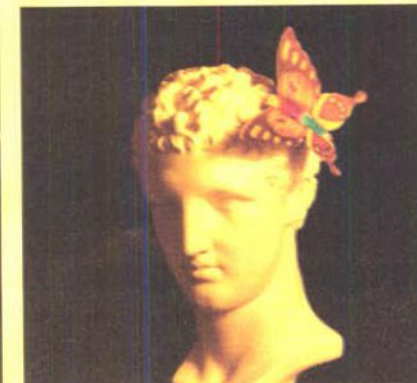
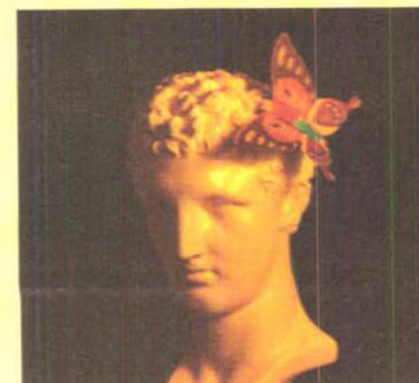
If you often take pictures in any public building, such as a shop or office, you will almost certainly come across fluorescent lighting. Yet fluorescent lighting is one of the hardest of all light sources to correct for. Unlike tungsten light fluorescent light does not work by heating a thin piece of metal with an

Sarah King

3400K

3200K

100 watt bulb

Type B film
with 82A filterType B film
No filterDaylight film
80A and 82A filtersDaylight film
with 80A filterDaylight film
no filter

electric current, and colour temperature does not apply (see page 220). So you cannot simply look at the colour temperature and make an appropriate correction.

More importantly, although fluorescent light looks as white as daylight, the basic light emitted by a fluorescent tube is *discontinuous*. Instead of emitting all the colours in varying proportions, it only gives out bands of light of certain wavelengths: some wavelengths are not emitted at all.

If certain colours are missing it may be virtually impossible to put them back even if you can identify which colours to replace. The fact that pictures taken by fluorescent light have a green cast does not mean that you simply filter out the green, because you might be left with little else. Fortunately, most fluorescent tubes are designed with a continuous spectrum of colours overlaying the discontinuous spectrum. This means that you can make some attempt at correction.

Lighting technicians use a colour temperature meter as a starting point, and correct fluorescent light using colour

correction (CC) filters by trial and error, but a simpler alternative if you do not have such a meter is to use a filter specifically designed for correcting daylight colour film in fluorescent lighting. This filter is referred to as FL-D and is available from most filter manufacturers.

Street lamps

Many types of street lamps, like fluorescent light, give a discontinuous spectrum and are therefore very difficult to correct. In fact, there is no correction you can apply to give correct colour rendition in sodium lighting because if you put a filter over the camera lens, you filter out all the illumination in the scene. If you want to take colour pictures in sodium lighting, therefore, all you can do is illuminate the scene with a flash.

There are a number of different types of streetlight in general use, easily recognized by their colour and appearance.

The most common streetlights are mercury (blue-green) and sodium (orange-yellow). Sodium lights are produced in two varieties—low pressure and high pressure.

Mercury streetlights have a spectrum which consists of several bright lines (see page 199) of varying strength, with virtually no red content at all. It is therefore impossible to filter the light to produce a white result, since there can never be enough red. The exact colour which mercury streetlights appear on film depends on the lamps themselves and the type of film used.

While they will always show a blue-green cast, they do give a certain amount of colour rendering to their surroundings.

Low pressure sodium lamps, however,

are almost completely one pure colour, yellow-orange. As a result, different colours are indistinguishable in their light. Examine the spectrum on page 199 under sodium lighting and you will see it solely in different tones of yellow.

Again, it is impossible to filter the colour of low pressure sodium lamps, and any photograph taken solely by their light will appear the same colour as the lamps.

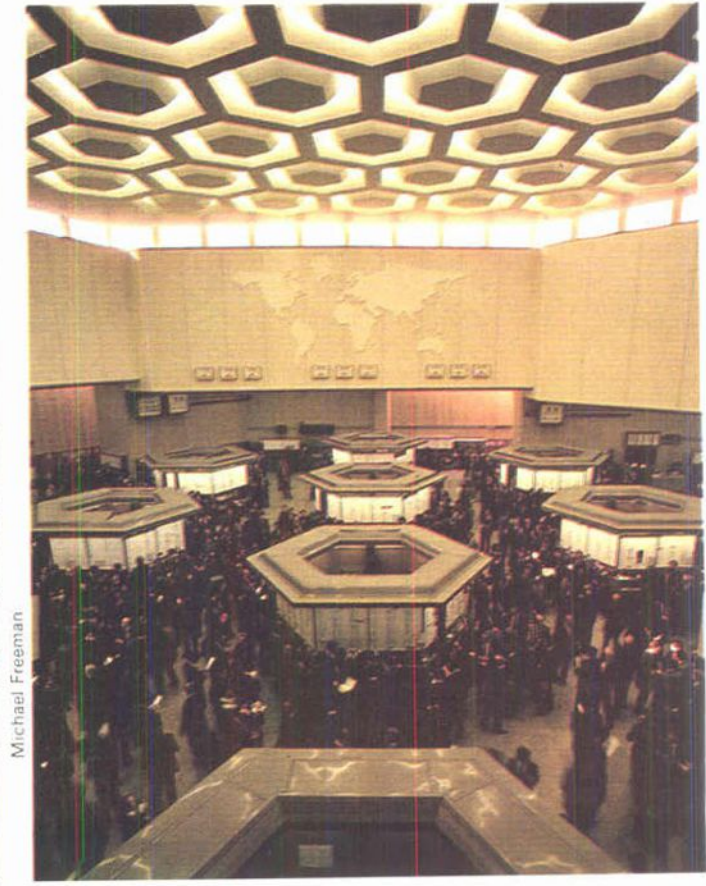
High pressure sodium lighting has a much mellow pink colour. While it has a strong yellow content, there are enough other colours to give a reasonable colour rendering, and for this reason these lamps are often used in city centres—where it is felt desirable to provide lighting that shows colours.

High pressure sodium light is fairly close to tungsten lighting in its characteristics, so for most purposes either artificial light film or daylight film with an 80B filter will be adequate. For perfect results, 'fine tuning' using colour correction filters is needed. Streetlights of this sort tend to vary widely in colour, so the correction which you establish for one particular lamp may be quite wrong for another lamp of the same type some way down the street. For most purposes, however, it is not important to fine tune the colour in this way as viewers will not expect pink street lighting to give white results.

As a general rule, when making colour corrections it is better to err on the warm side, with a red or magenta cast, than on the cold side, with a blue or green cast.

Stock Exchange The green cast caused by fluorescent lights can be extremely difficult to filter out. An FL-D filter gives some improvement, but the result is still far from perfect.

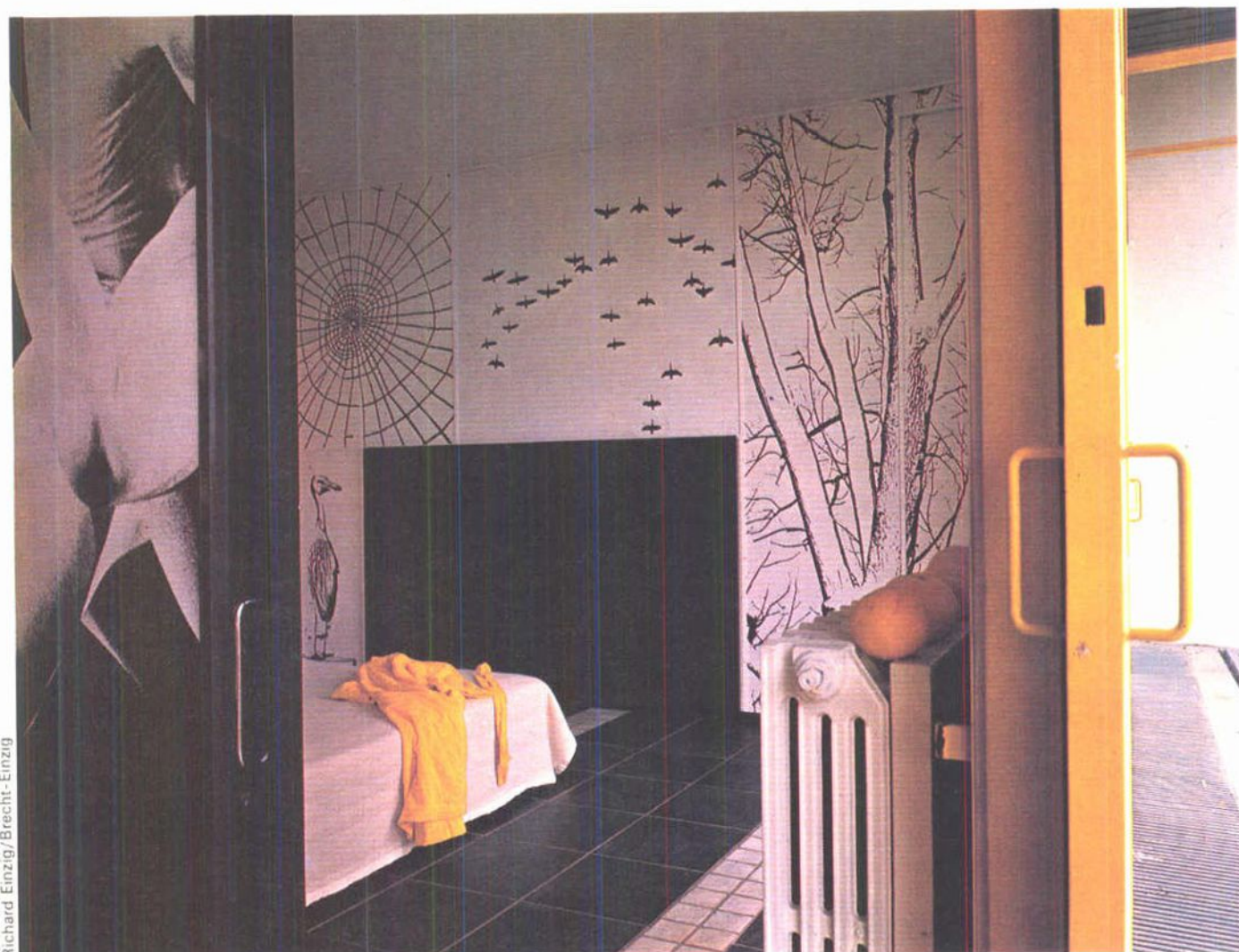
Matching film and light source A test model consisting of a white subject (the bust) and a multi-coloured object (the butterfly) was photographed on daylight and Type B colour slide film, with a variety of different filters and light sources. The results show that there is very little practical difference between the colour of the light from 3400K photoflood bulbs and that from longer lasting 3200K photographic bulbs. But it can be seen that even with the manufacturer's recommended filtration, results on daylight film are inferior to those on tungsten film.



Michael Freeman

Giant enlargements

Giant prints are fun to make and have a greater visual impact than their smaller counterparts. But not only is image size magnified, so too are all the problems normally associated with printing



Richard Einzig/Brecht-Einzig

Every photographer is keen to show off his or her work, and usually this takes the form of prints no larger than A4 size. Occasionally one might attempt a print as large as 40 × 50 cm for exhibition or display, but it is also possible to make enlargements much bigger than this, either for a display or as a feature in the home.

Such a print might be in the form of a mounted picture much larger than usual—say of a favourite holiday view—or it may be a mural, maybe even completely covering one wall. In this case the subject matter may be more abstract. It is also possible to use such an

enlargement to fool the eye—the classic *trompe l'oeil* of artists—into believing that a doorway, for example, leads onto some glamorous or unusual location, by mounting the print on the door itself.

In theory such prints may be made in both black and white and colour, but even black and white prints involve considerable expense. Only those experienced in making giant b & w enlargements, as well as in colour printing, should attempt giant colour enlargements because of difficulty and cost.

Giant prints and photomurals are produced in a similar way to conventional enlargements, though the technique

Abstract murals Large, specially made prints are a good way to decorate walls and cupboard doors of playrooms, hobby dens and bedrooms

varies in its details. The distance from the enlarger to the paper is much greater, which introduces complications, and the processing is more difficult, requiring extra equipment. Fortunately, the equipment is easy to assemble, and need cost very little.

The maximum size of enlarging paper readily available is 50 × 60 cm, so prints bigger than this must be made on paper cut from rolls, or in sections. Rolls

of photomural paper, which is on a tough, crease resistant base, resembling a thick wallpaper and with a somewhat coarse finish surface, is still available from some outlets. But this is now being phased out in favour of resin coated bromide enlarging paper. Available in rolls up to 101.6 cm wide, it is supplied in lengths 30.5 m in either glossy or semi matt surface finish. The cost is quite high—as much as a cheap SLR for a long, wide roll—so the size of the final prints should be carefully planned to make the most economical use of the material. It is a good idea to cut the roll into sheets of the required size and then to use the leftover waste pieces as test strips.

Selecting a negative

Ideally, the negative to be printed should be the sharpest that it is possible to produce with your existing equipment. If you are taking a picture specifically for the purpose of making big enlargements, choose a fine grain film, focus critically—and then check the focus a few moments later. The camera should be mounted on a substantial tripod, the lens closed to its best working aperture, and the exposure made at the highest possible shutter speed using a cable release or the camera's delayed action mechanism. Your exposure and the subsequent development, should be aimed at producing a slightly thin, but fully detailed negative of good contrast. Avoid both overexposure or overdevelopment. It is

sensible to take a number of shots, varying exposure and perhaps focus.

The enlarger

It will be necessary to increase the distance between the enlarger lens and the paper to a much greater extent than the usual enlarger column baseboard will normally allow. One way of doing this is to swivel the head on its column and to project on to the floor, with a substantial weight on the baseboard to act as a counterbalance. With some enlargers it is possible to swing the head sideways at right angles to the column and to project the image horizontally on to the wall. In this case it is simply necessary to move the enlarger suitably far away from the wall, and to ensure that the paper is held parallel to the negative in the enlarger's carrier.

Because of the long throw between the enlarger and the paper, it is essential that there is no risk of the enlarger vibrating. Insulate the enlarger from the surface on which it stands with rubber mats or foam. It is also important to check the enlarger's optical system to make sure that it is as efficient as possible. This means cleaning the condensers and negative carrier cover glasses, and certainly dusting the lens so that its surfaces are clear of any particles of dust that could degrade its performance and create flare.

Check the darkroom itself for light leaks. Even minor ones that under

normal circumstances would be of no consequence must be eliminated. You are likely to be using long exposure times, so any light leaks within the darkroom could reduce image contrast and even fog the paper.

If the enlarger is normally used with a lamp of a lower wattage than the maximum recommended for your particular model, fit the maximum size allowed. As long as you only use it for actual tests and exposures, and not for focusing, a lamp of an even higher wattage (such as a No 1 Photoflood) could be used, but it should be switched on only for the shortest possible time to avoid the risk of overheating and damage to the optics or even to the negative itself. Tungsten halogen lamps, where fitted, offer the best light source.

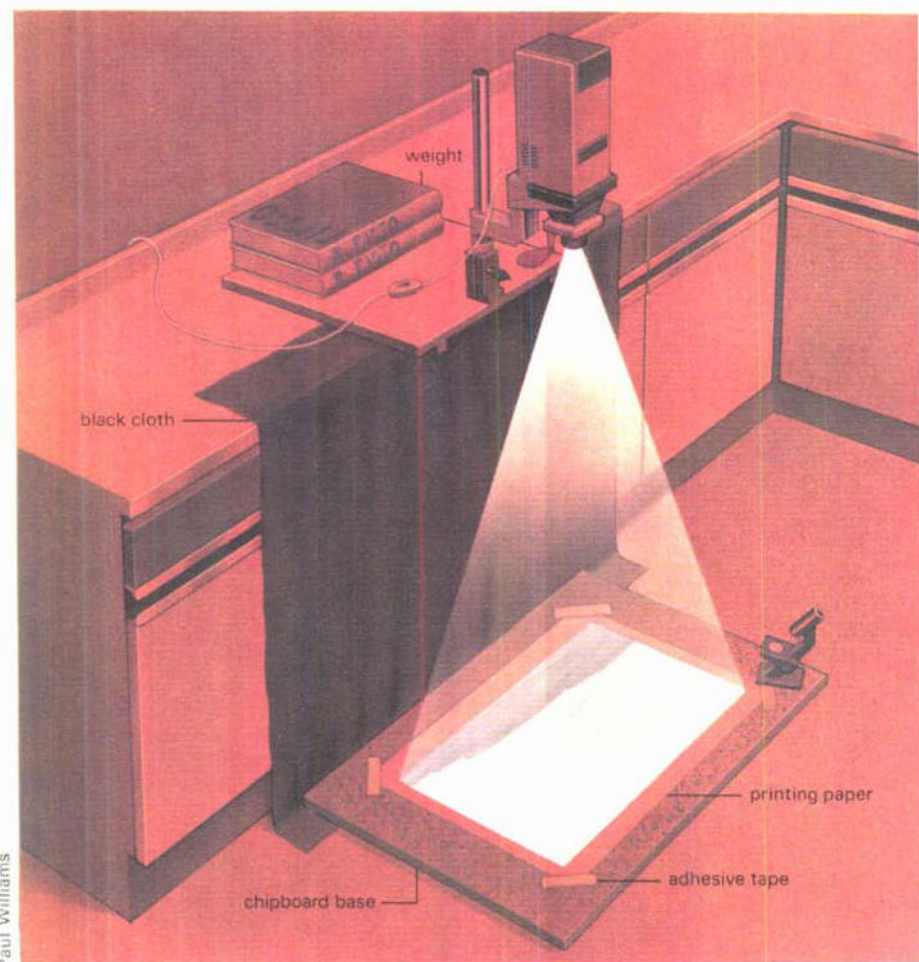
If it is possible to obtain a shorter focal length enlarging lens than usual, this will help to reduce the throw and also the exposure time. Various wide angle designs are available, but they are an unnecessary expense if you make giant enlargements or photomurals only infrequently. If you are making a selective enlargement, a focal length lens for a smaller format can often be used.

Remember that it is the diagonal, rather than the width, of the image area that dictates the focal length of the lens to be used. For example, when the entire image area of a 6 × 6 cm negative is being printed, a 75 mm lens is normally required. But if the selected portion of the negative measures only 36 mm along its longest side, then it would be better to use a 50 mm lens. This is the focal length of lens normally employed to enlarge from a whole 35 mm negative.

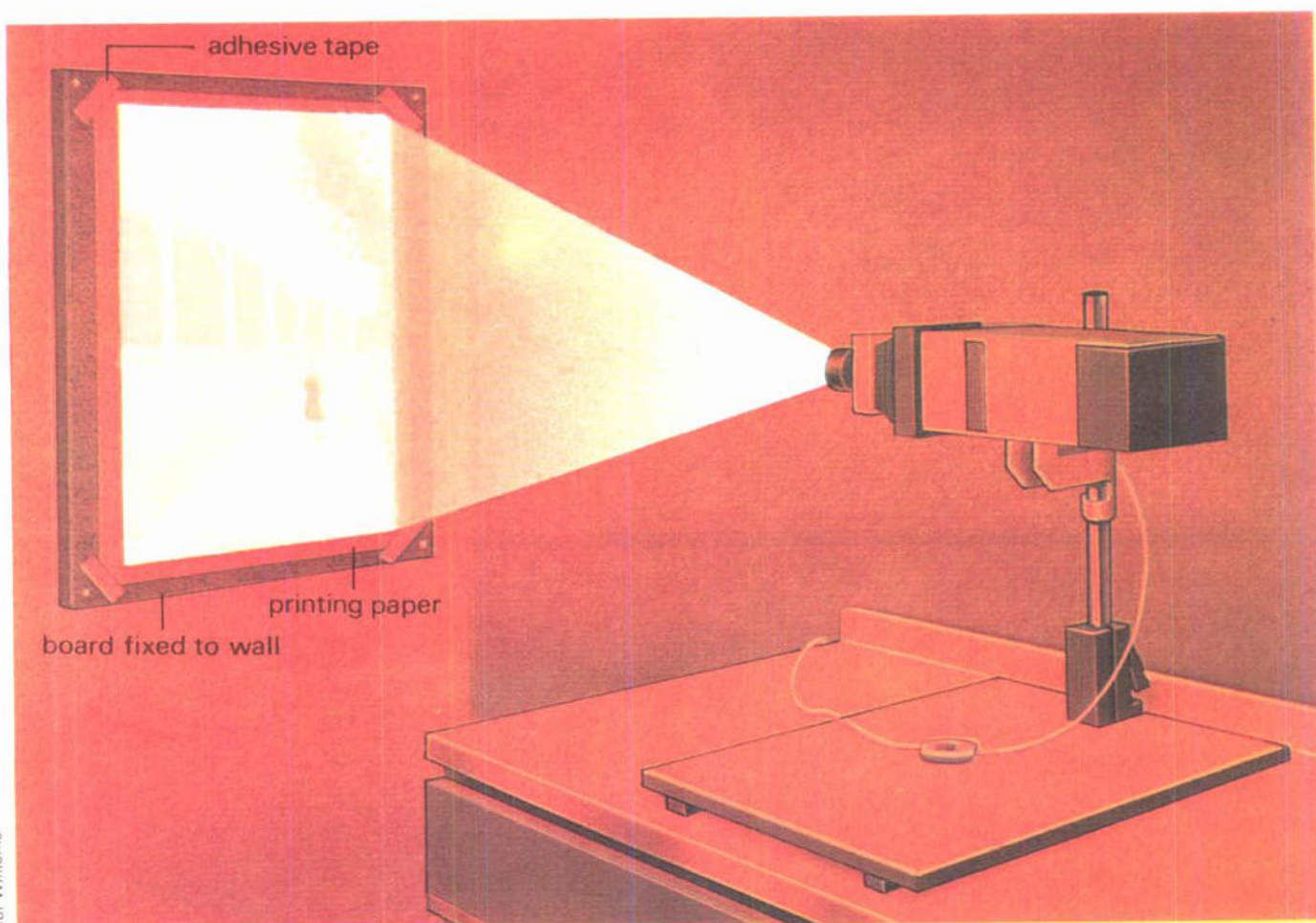
If the enlarger's carrier accepts negatives larger than the one being printed, or if only part of the negative is being used, mask off the surplus area. Light passing through this area can cause flare or unwanted reflections that will reduce contrast and yield a degraded image by fogging the highlights.

Maintaining paper flatness over a large area during the enlarging exposure is especially difficult when the holder or easel is in a vertical position. Commercial laboratories use vacuum easels, but in a home darkroom you can make use of double sided sticky tape or ordinary tape to keep the paper firmly in place.

Focusing over great distances and at high magnifications presents its own problems in addition to those created by the relatively low level of illumination. Enlarging lenses are usually computed to achieve their peak performance over a certain range of magnifications, and the results can prove disappointing for giant enlargements, especially with the less expensive types. Flatness of field may prove a problem which you can



Increased enlargement The effective throw of the enlarger can be increased substantially by turning the column and projecting the image on to the floor



partly solve by focusing the image midway between the centre and the edge, and then stopping down the lens.

Some lenses suffer a slight focus shift as they are stopped down. This often goes unnoticed on small and moderate size enlargements. But for giant prints and photomurals it is best to focus such lenses at the exposing aperture. Because of the reduced illumination when the lens is stopped down, switch off the darkroom safelights, let your eyes become accustomed to the dark, and then focus the image. Wait a minute or two, and recheck the focus.

Focusing on the image grains is an excellent method, if you can see them. Alternatively, use a special focusing negative—preferably an underexposed neg from the same film—but take great care not to disturb the enlarger when you replace this with the negative of the picture to be printed.

A focusing aid, of the sort which you may use for conventional enlargements, is very helpful.

Print processing equipment

It is uneconomical, if not very difficult, to buy developing trays for the size of giant print or photomural that is normally made. The best method is to make a trough that is a little longer than the width of the print, and to process the print by seesawing it through solutions in the trough itself. Plastic plant troughs, waxed paper troughs that are supplied

with ready-pasted wallpaper, or anything similar can be used. But it is quite easy to make a simple wooden trough and to line it with a plastic sheet. A black plastic refuse sack, cut and shaped, is ideal but check its watertightness.

A trough can also be made from a half section of PVC drainage pipe cut along its length. Ideally the diameter of the complete pipe should be about 25 cm or more, otherwise the paper must be put through too sharp a curve during the seesaw processing. The length of the trough need be only a couple of centimetres greater than the width of the paper, the ends closed off, and the cut edges smoothed to avoid scuffing the emulsion of the paper.

One refinement that may prove helpful is to fit each trough with a roller of small diameter plastic pipe, underneath which the paper is fed, emulsion side down. This will help you to seesaw the paper smoothly, and may also allow you to use less solution, since the distance between the paper and the bottom of the trough is fixed and controlled.

The seesawing method requires practice, and usually needs more than one pair of hands. If you are doing the work unaided, it will probably help to fasten the ends of the paper to rods, to keep them straight.

An alternative method using a trough, which is possible with resin coated paper, is to roll up the paper, then progressively form a new roll with it in

Swinging the head Most enlarger heads swing, allowing you to project an image on to a nearby wall.

Although you have to take special measures to pin the paper in place (and keep it flat), this method involves a minimum amount of disruption in an ordinary darkroom set-up

the trough, exposing a few centimetres at a time.

It is important to wear rubber gloves when carrying out all such operations, to prevent dermatitis.

Whichever mechanical method is employed for print processing, it is a good idea to use the developer at half strength, or even further diluted. This will help to make sure that the entire print area is developed evenly, despite the fact that all the emulsion will not be wetted simultaneously.

Stop bath and fixer should always be used at the correct dilution and, in view of the fact that the print is likely to be on permanent display, neither fixing nor washing should be skimmed or curtailed.

To make sure that the print lasts, and is free from staining and fading, it is essential to remove all soluble silver compounds and fixer chemicals from the emulsion. Use a hypo clearing agent to ensure that this takes place, since water alone can never be relied upon. Wash the print in the bath or hose it down. The print can then be hung up to dry in the normal way.

Test strip exposures

Your final print exposure should be exactly the same as that of the test strip or print that achieves the optimum result. So to be of any real value, record details of the successful test, preferably on the back of the print itself. Any shading or burning in should also be noted, and the test should be developed to finality. If necessary, make an extra test print, using the final information as a double check before exposing a costly large sheet of paper.

Low intensity reciprocity failure will affect the exposure times. So do not automatically assume that a one stop change in the lens setting with a halving or doubling of the time will yield a halving or doubling of the exposure.

Photomurals will almost certainly have to be exposed in sections, which are later joined at the mounting stage. When composing the picture sections on the easel, make sure that there is sufficient overlap for joining later. Allow for uneven expansion and contracting of the paper when it is soaked and then dried, and for trimming away the area near to the edges which may distort. Also allow for shrinkage if the print is to be mounted wet.

Large prints can be mounted in a dry mounting press using dry mounting

Soothing scene Choose your images for giant enlargements carefully especially if they are to be used in a location like this

Trough processing Using troughs is the best method for processing really large prints. If you have assistance, simply seesaw the print through the solutions in turn. If you are working on your own, roll the print in each bath

Ulf Knoppel/Camera Press



Jon Bouchier

tissue (dealt with in a subsequent article), or using any of the regular adhesives for photographs. The support can be made from good quality cardboard, plywood, blockboard or hardboard and so on. Both sides of the support should be sized if a print is to be wet mounted—the size can consist of a dilute form of the mountant.

Various special mountants are available for mounting resin coated materials, some of which are dispersed from an aerosol can. Some of these even permit the print to be removed and repositioned. Finally, the surface of the print can be sprayed with a protective lacquer, which enables it to be cleaned.

Although suitable colour print material is available in similar sizes and rolls to b & w emulsions the cost is likely to prove prohibitive (about twice that of black and white). More important, though, there will be great difficulty in maintaining colour fidelity because of the likelihood of uncontrollable temperature variations of the various solutions during processing. Trough or drum processing is possible up to moderate sizes—above these even the cost of chemicals is prohibitive.



Creative approach

Wild flowers

Given a careful, thoughtful approach, it is not difficult to take good pictures of wild flowers, and their natural delicate beauty makes them ideal subjects in their own right

Surprisingly, a good photograph of a wild flower may have more immediate visual impact than the flower itself. There is something about the precise framing of a photograph, concentrating on detail to the exclusion of all distraction, that can focus attention on the tiniest, most insignificant bloom. In the photograph, minute petals and stamens, coloured veins and fragile hairlets, can all be made clear and prominent. This is something unique to photography.

There are as many approaches to photographing wild flowers as there are photographers. One of the great attractions is that wild flowers are both accessible and cooperative as subjects, which makes it relatively easy for the photographer to learn about close-up technique, composition and the use of colour.

For all practical purposes, there are three broad types of wild flower photograph: the shot of the flower or flowers

in context, the 'portrait' of a single specimen, and the extreme close-up, revealing details almost invisible to the naked eye. There are also any number of individual approaches between these three categories, and once you have mastered them you can try to develop an individual style.

Before discovering your own personal approach, however, you have to master the straightforward techniques. The first requirement is to find suitable wild flowers to photograph. It is particularly important to remember that many species in the polluted modern world are in grave danger of local, or sometimes even global, extinction. Many countries have laws protecting wild plants, so carelessly picking flowers may be more than just stupid—it may actually be illegal. If you are in doubt, touch the plants you are photographing as little as possible, if at all.

Despite this cautionary note, some

species of wild flowers can be found almost anywhere. Look out for flowers growing wild in gardens, parks, and even between the stones of city pavements. The weeds gardeners complain of will often bloom briefly but prettily if left alone to do so, although in gardens they may be upstaged by their larger and more gaudy cultivated cousins. The real place to find wild flowers, however, is in the countryside, and the wilder the landscape the better. In some farmland areas the use of pesticides and the removal of fences and hedgerows have reduced the incidence of wild flowers, but you will find that more remote land,

White sand *A wide angle lens and a close viewpoint help to show flowers in their environment*

Poppies *Adopting a low viewpoint enables you to outline certain flowers effectively against the background*





whether woods, moorland, or scrubland, will have a crop of flowers at one time or another during the year.

How many and what type of flowers you find depends on where you happen to be and the time of year. Even in the depths of winter there may be flowers around if you look carefully. And if there are no flowers there may be berries, fruits and nuts in various stages of development. Some parts of the world have no winter season at all, and flowers are abundant all the time.

Different flowers may be found in exactly the same spot through the year. This could make an interesting subject for a long term photographic study. If there is a glade in a wood that you know and enjoy visiting, for example, go back at different times of the year and see the changes.

Relating the flowers to such an environment is one of the three main approaches already referred to. This is relatively simple and does not require specialized equipment. It does, however, demand a skilled eye for composition. The most suitable format is rectangular, used horizontally from a low viewpoint or vertically from a high viewpoint. 35 mm is ideal, although the square format of 6 x 6 cm roll film cameras can also be used. The standard approach has the wild flowers in the foreground, with grasses, bushes and trees taking up the

middle and far distance. This layout can work equally well in other types of landscape. A few flowers set in a rocky desert, for example, can be very effective. Even the sky, with strong cloud shapes, can be included. Here, a vertical or square format may be more suitable. The key to such shots is to balance the foreground interest, including the bright colours of the flowers, with the stronger shapes and darker or contrasting colours of the background. For this type of shot, use a wide angle lens—anything from an 18 mm rectangular format fish-eye

(on 35 mm) can be suitable, although 24 mm or 28 mm will probably be more effective in most circumstances. The wide angle lens allows great depth of field, so that the flowers close to the camera are in sharp focus at the same time as the distant background, especially when the lens can be stopped down to a small aperture. The lens also has a wide coverage, emphasizing the breadth and space of the landscape. With a wide angle lens, it is possible to photograph such scenes as a tiny alpine flower against a backdrop of vast mountains and sky, or a clump of brilliant poppies in rolling countryside. The wild flowers are thus shown in their environment more effectively than by any other method.

When confronted by a bank of wild flowers, all of different colours and sizes, the impulse is to photograph it to show the variety to be found. This can be more difficult than it seems. Stand well back and there is a risk that each individual bloom will be lost among the background. In a print, the flower colours may be overpowered by the uniform green of the bank unless an individual print is made.

One approach to this problem is to shoot along the bank, rather than face it square on. At a particular angle you may be able to include a wide range of flowers and some of the surroundings as well. Depth of field is often limited, particularly with telephoto lenses, but it is often not necessary to get all the blooms and the background perfectly



Burdas/fotogram

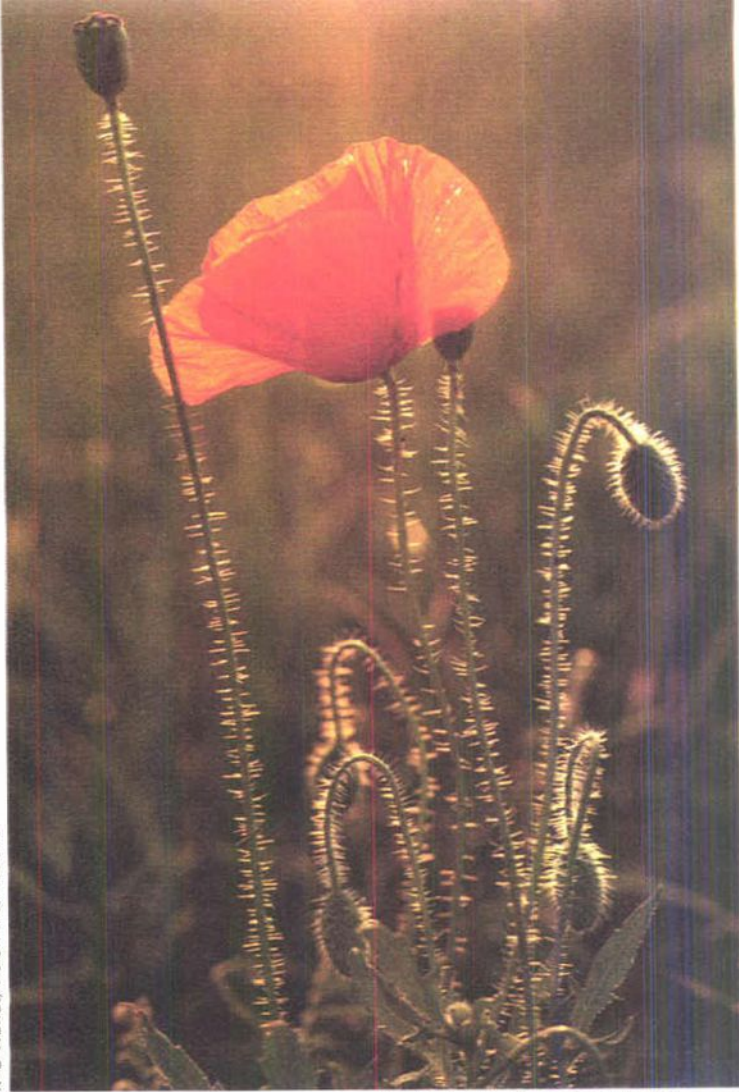
Close-up With a macro lens you can reveal the minute details that the eye does not always see clearly



Tapdance



K-O Hundt/Vision International



Joy Langsbury/Bruce Coleman Ltd.

sharp. A defocused suggestion of the background is often very effective, giving all the environment that is needed.

The second approach to wild flower photography is the 'flower portrait'. Here a single bloom, head of flowers, or plant is the subject, carefully framed and composed to include the minimum amount of distraction. The problems encountered with this type of shot are much greater than with the general view. First of all, except with very large flowers, some means of approaching the flower closely will be needed. The close focusing distance of a standard lens will often not be sufficient, so some type of close-up device will be needed (see pages 404 to 407).

Best of all for wild flowers are macro lenses, which focus much more closely than standard lenses, even giving their best resolution with subjects very close to the camera. They are available with a variety of focal lengths—55 mm, 105 mm and 200 mm, for example. These lenses will enable you to fill the frame with many wild flower subjects, but they are expensive. Cheaper approaches include supplementary lenses, which attach to the front of a normal lens like a filter, and methods of extending the lens away from the camera. Extension rings and tubes and bellows attachments fulfil this role. You should add one of these systems to your equipment if you expect

to take close-up shots of flowers frequently. The quality of the image will usually be better with these lens extensions than with supplementary lenses, but their only disadvantage is that they require additional exposure. Extending a 50 mm standard lens, for example, will give life-size reproduction of the flower but will require two extra *f*-stops of exposure.

The 'flower portrait' approach demands a detailed and technically precise result, so a film with good definition and a small grain size is an advantage. For colour slides, for example, Kodachrome 64 is very suitable, although Kodachrome 25 may be even better in good light.

Care will be needed when taking the shot to control focus and exposure. One immediate problem may be that the flower is constantly moving in the breeze. Various expedients can be employed to overcome this. First, a thick wire with a clip fixed to one end can be stuck in the ground next to the plant and gently clamped to the stem, out of the picture frame, to keep it relatively steady. Second, some form of windbreak can be added. Either a piece of card can be placed between the flower and the wind or, even more effectively, a box, providing a built-in background, can be placed over the plant. The box must only have three sides to allow light to reach the subject

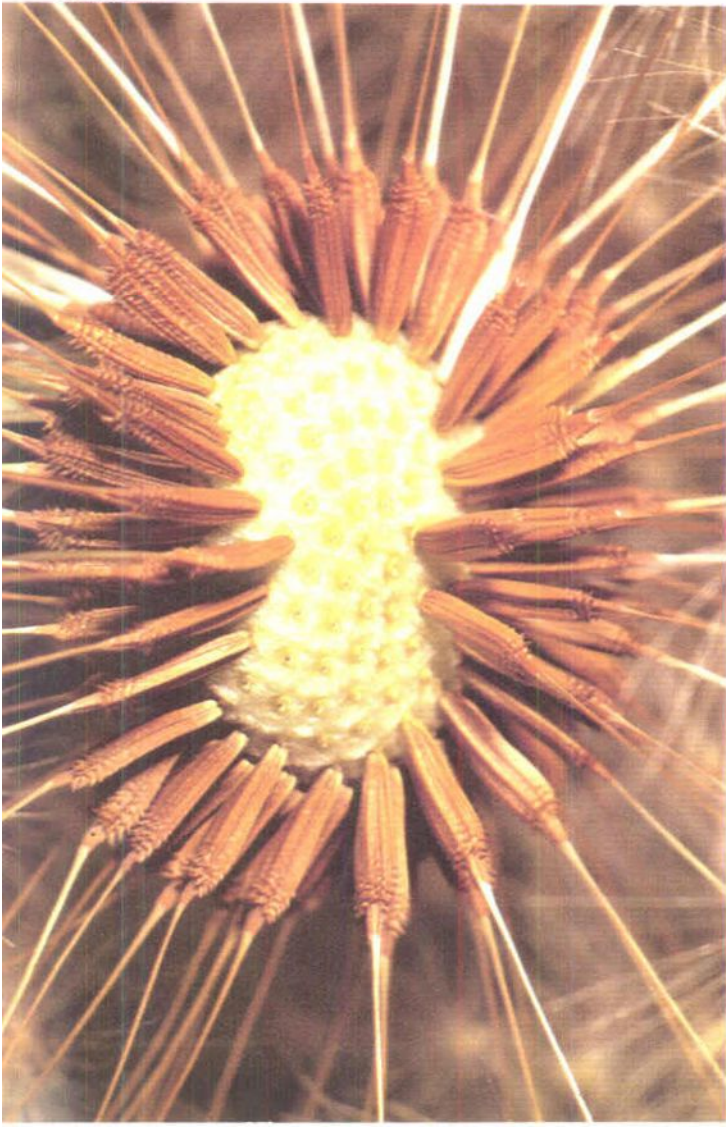
and to allow the camera a view. In both these ways a haven from the wind can be created.

When photographing wild flowers it is even more important than usual to make sure that the framing and focus are correct. A tripod or some other means of support is invaluable. Professional photographers almost always use tripods for static subjects and the amateur would do well to learn from their example. A good portable model should not be too heavy to carry in the field but should still provide a stable camera platform. For wild flowers, it is also important that it can be adjusted close to the ground. A reversible centre column can be useful for this, allowing the tripod to be used at medium height with the camera suspended below only a short way from the ground. Other supports worth considering are a ground plate (a heavy plate with a tripod head mounted) which can be used on flat ground, or a ground spike which can be stuck in the ground next to the flower, again with a tripod head. Both these supports are easy to transport, but they have less versatility than a tripod. Some sort of groundsheet for the photographer to lie on is also an asset!

Having achieved the desired framing, with the camera securely supported, the focus must be adjusted. A new set of problems is involved, largely because



Barrie Smith



Pamla Toler





Hedgerow Sometimes an ordinary hedgerow with a wide variety of flowers can yield very attractive results

depth of field is very limited at close distances, and you may have to choose which part of the flower to concentrate on for the most critical focus. As a general rule with close-ups, choose a point halfway between the nearest and farthest points that you want to be in focus. Then you must make a conscious decision about the amount of depth of field required. It will, in any case, be short, but the aperture you select will make a great deal of difference. The minimum aperture (and therefore maximum depth of field) will not necessarily be the best choice as it may include too much of the distracting background vegetation, or even foreground obstructions such as grass that you hardly notice through the viewfinder with the aperture fully open.

Experience is needed to find the right depth of field, but you can try bracketing apertures—shooting the same scene with several different apertures (adjusting the shutter speed to maintain correct exposure). Try $f/16$, $f/11$ and $f/8$, for example, depending on how close you are to the subject. For really troublesome flowers, surrounded by a mass of tangled foliage, a medium telephoto lens may be needed to reduce the depth of field and throw the foreground and background right out of focus.

Another useful way of controlling the composition of the shot is to undertake a certain amount of 'gardening'—that is, removing distracting foreground obstacles by bending them back and gently weighting them down with sticks. You should also look for any dead stems or leaves that you can simply do away with. In addition, you may want to separate out one or two blooms using the same technique so that the shot is not confused by too many flowers at different levels of sharp focus as they may not all be equidistant from the camera. For the same reason, you may want to arrange

Picked flowers Roger Phillips' specimen shots have a 1 cm circle in the picture to show the scale of the flowers



the stalk so that it is at right angles to the camera and all in focus. A confused background can also be a problem. 'Gardening' is one approach but the choice of a suitable viewpoint can also be effective. Dark and distant vegetation can provide an excellent backdrop against which the flower's colours will be visible. You can also use a dark card as a portable 'studio backdrop', placed sufficiently far away to be out of focus. Some photographers take a piece of black velvet to drape behind the subject—this is easily transported and is very effective.

The final category of approach is the extreme close-up. This can produce some of the most exciting flower pictures of all. Few people are even aware of the fascinating details, rich colours and varied textures found in the centre of a simple flower. The closely cropped image almost gives you an insect's eye view, and indeed, small insects such as ants exploring the flower can add an interesting touch. The techniques are essentially the same as for the close-up

Trevor Wood

Roger Phillips from *Wildflowers of Britain*, Pan Books

flower portrait, although the problems will be correspondingly greater. Even a macro lens, for example, will probably require some extension. A tripod is essential for this type of shot. To achieve depth of field, minimum apertures will have to be used—requiring slow shutter speeds. Great care and preparation are needed, but when you see the results you may be amazed by the secret, miniature world which is revealed by extreme close-up photography.

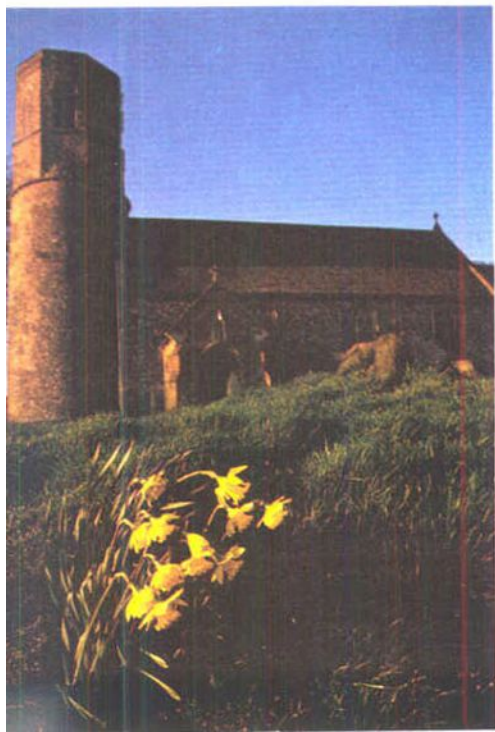
As with most types of photography, the quality of the lighting is of great importance. The cardinal rule is that bright sunshine is not necessarily the best form of light. Harsh shadows do not make for satisfying close-ups, even if the higher level of illumination does reduce the problems of having to work with slow shutter speeds. In bright sunlight, try using a reflector to fill in the shadows on the flower. Place a white card on the opposite side of the flower to the sun and reflect some of the light back onto its dark side. Another technique is to use a diffusing sheet of tracing paper or some other translucent material. Because wild flowers are small, the sheet will not have to be more than a metre or so across to moderate all the direct sunlight falling on the subject. Simply place the sheet between the subject and the sun.

The best natural light is probably that of a lightly overcast day, when the diffused light coming through the clouds will be sufficient for satisfactory exposure, but will also cause the colours of the flower to appear richer and more saturated on film. Early in the morning can be a good time since dew is a very attractive addition to the image. At this

Outline *Picking out one flower with the sun behind it is an ideal way to show the shape of an individual plant*

Daffodils *With a wide angle lens you can use a foreground of flowers to lead towards a background subject*

Robert Valarcher/Atlas Photo



Trevor Wood

time of day the flowers themselves are likely to be at their best, freshly opened, and not withered by the heat of the day. Backlighting can be particularly effective, perhaps with a dark background. Flowers lit in this way have a translucent, luminous quality. Remember, however, that for all its benefits, cloud cover may alter the colour temperature of the light falling on the subject and it may be necessary to add colour balancing filters in order to achieve the most accurate colour. In light cloud, you can use an 81A filter if you wish, increasing the strength through 81B, 81C and 81D according to the heaviness of the cloud. In this way a blue cast can be avoided.

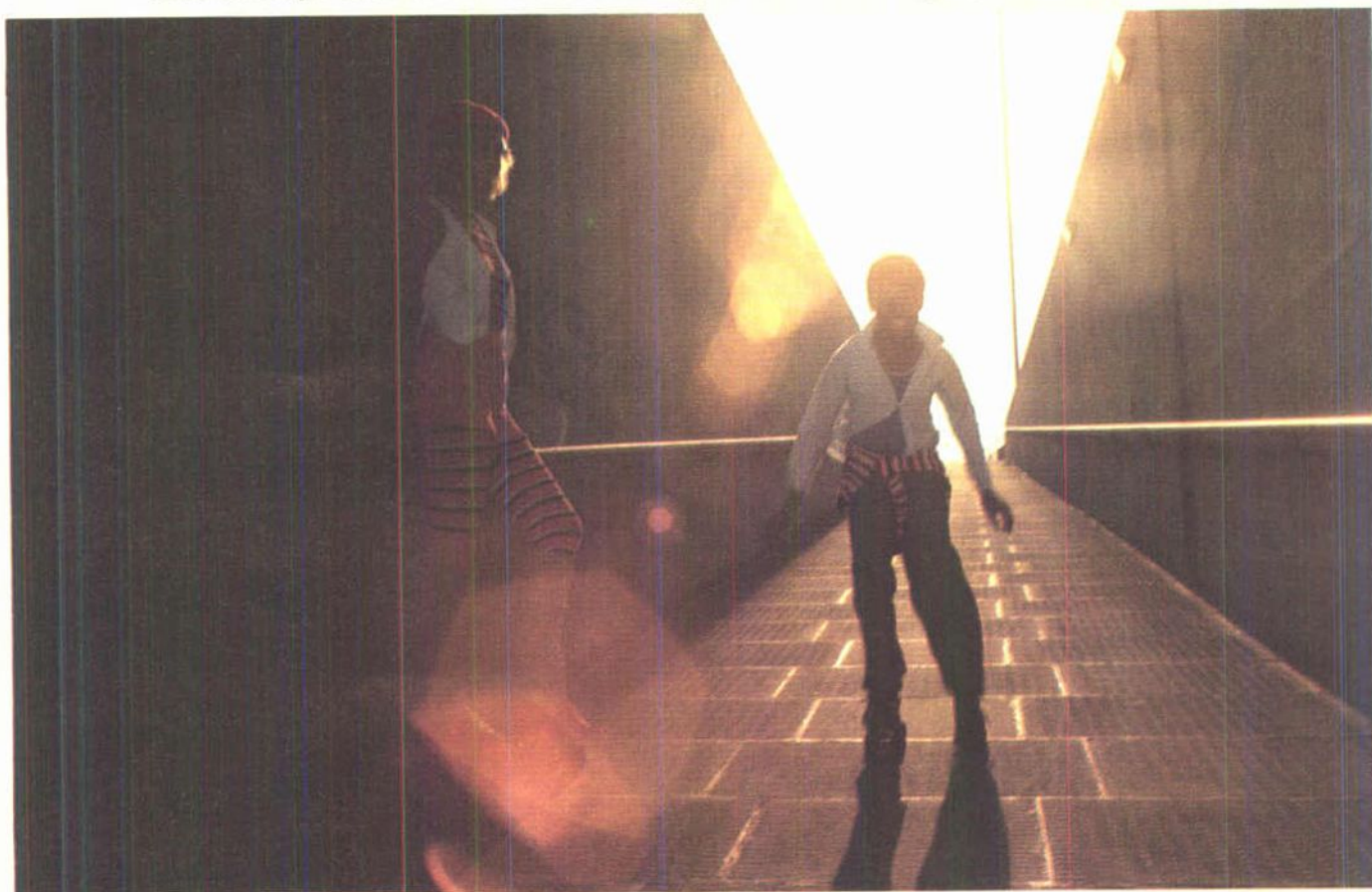
Flash is more successful for close-up shots of flowers than might be expected. Because a portable flash unit is such a large light source in relation to the size of the subject, you will not have the problems of unattractively hard shadows that often occur with this type of lighting.

The flash is best diffused through a diffusing sheet (as described above) or reflected from a white card or umbrella. With extreme close-ups, however, the diffusion is unnecessary. If you intend to take many wild flower pictures with flash, experiment until you have established a standard arrangement of lens, flash power and position. In this way it will be possible to duplicate good results over and over again. The best position for the flash is unlikely to be the camera's hot shoe. A position slightly to the side and above the subject will give some modelling to the flowers.

Photographing wild flowers is a challenging branch of photography. It is not especially difficult, but the possibilities are very varied and the rewards are high. Whether you want to use wild flowers to enhance the foregrounds of your landscape shots or as complete subjects in themselves, they offer a great deal of creative scope.

Lens flare

Flare is a frequent problem which all photographers encounter at some time. Its effects can be subtle or severe, and its presence is not always obvious. But knowing its cause helps you to avoid it



Geg Germany

When a film is exposed in a camera, ideally only light directly reflected from the subject would affect the film and the contrast of the image reaching the film would be exactly the same as that of the subject itself. Unfortunately, in every camera, unwanted light or flare can reach the film from various sources and cut down contrast, sometimes severely. And with colour film in the camera, flare can produce washed out colours.

In the right circumstances, you can actually see flare in the viewfinder of an SLR camera. If you look through the viewfinder with the sun behind you and then turn around to face the sun, you will notice that image contrast drops dramatically and the shadows become grey.

The most important source of flare, known as lens flare, comes from multiple reflec-

Flare patches *Perhaps the most common type of flare appears as one or more coloured patches. These often take the form of a distorted image of the aperture*

tions from the surfaces of the glass lens elements—wherever there is a glass/air surface, a small proportion of the light passing through the lens is scattered. If the lens has a large number of elements with many glass/air surfaces, then the amount of light scattered could be quite significant.

Although some of this scattered light is reflected back out of the lens, a great deal can reach the film. Because there are so many reflections and re-reflections from the various glass surfaces, the scattered light reaches the film more or less at random. It falls on the film as a fairly even flood of light almost as if, inside the camera, there is a small light source which is switched on

every time the shutter opens. Under some circumstances some of the flare light can appear as out of focus ghost images of light sources in or just outside the field of view.

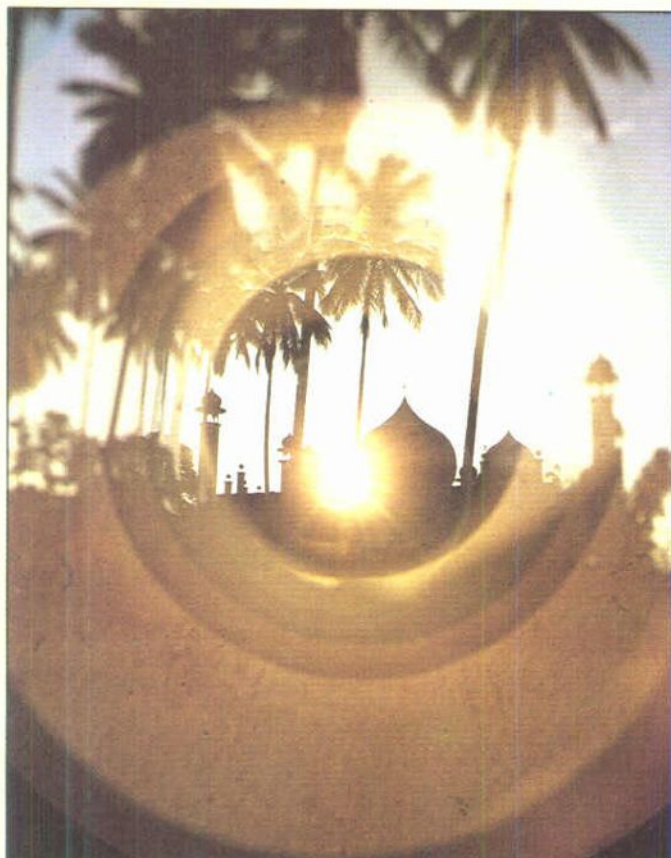
Additional flare may come from reflections from iris diaphragm leaves, the interior of the lens mount, or from the imperfectly blackened ground edges of lens elements. Even light reflected from the film surface on to the blackened interiors of some cameras can add to the general flare level, particularly when bright sunlight strikes the front surface of a lens obliquely. Bellows cameras are far less prone to this form of flare than modern rigid-bodied cameras because the corrugated cloth bellows can be almost com-

pletely non-reflecting.

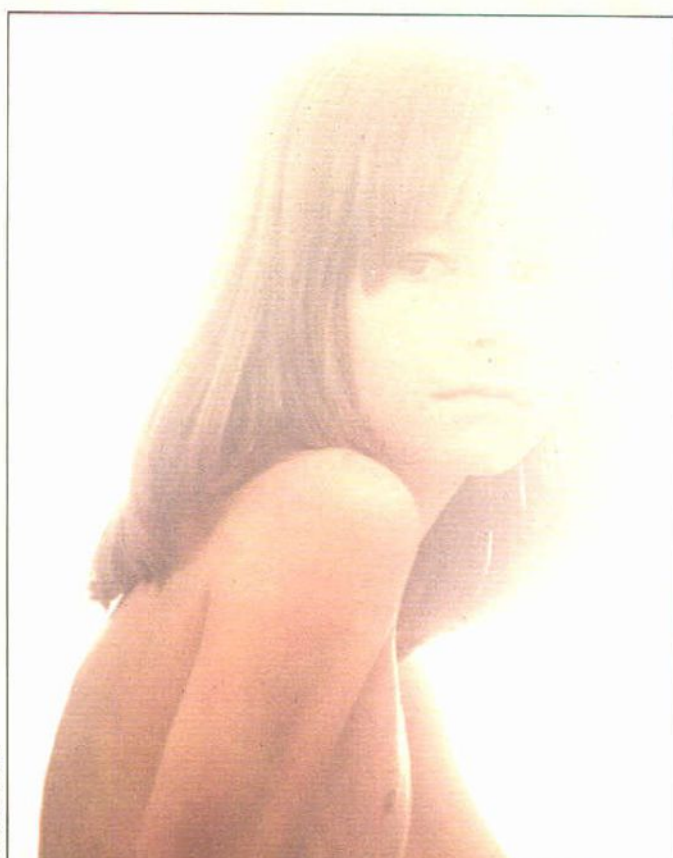
Although flare reduces contrast in general, it affects the shadow areas in particular. With colour slide film it reduces colour saturation and may give unwanted colour casts because the flare is tinted by a large strongly coloured area in the subject. Ghost images of the iris diaphragm of the lens or light sources just outside the field of view are also common.

Flare tends to increase with scene contrast and a scene with bright highlights and deep shadows often creates a great deal of flare. This can actually be useful since the flare will serve to cut down excessive contrast.

It is usual to state flare as a factor by which scene contrast is reduced in the image projected on the film. If a subject with a luminance range of 100 to 1 forms an



Bob Croxford



Geg Germany

image with a range of only 50 to 1, the flare factor is 2. Flare factors can vary from about two to as high as ten under adverse conditions but values depend on subject conditions as much as on the lens and camera. Shoot into the sun and the flare factor rises sharply.

Lens manufacturers can establish roughly how much flare there is in a darkroom. They set up an illuminated panel, such as a light box, in front of the camera and switch off the room lights. They then open up the back of the camera so that the image of the panel is projected on to a screen held close behind the camera. Any light falling on the screen outside the image of the panel is flare. With the right equipment, this flare can be measured.

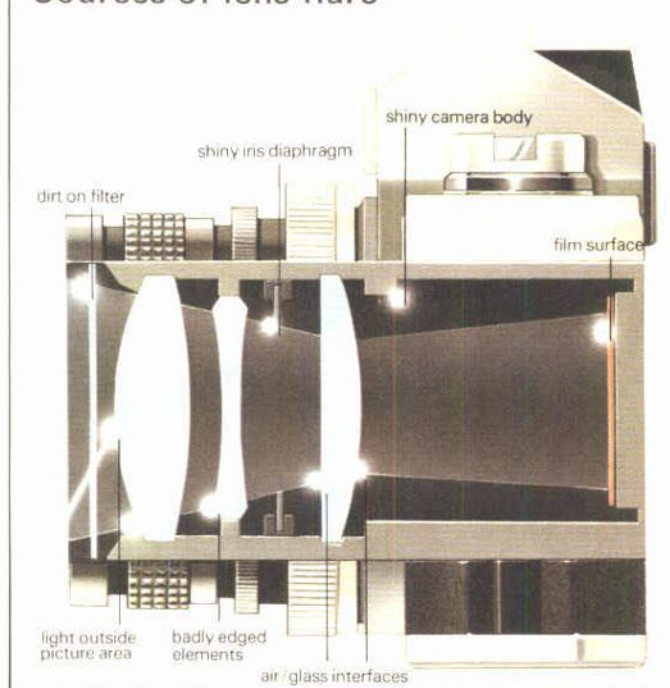
However, in everyday photography and in studying tone reproduction, flare has to be evaluated by comparing the characteristic curve of a film (see page 131) plotted for no-flare and flare conditions.

Obviously lens designers go to considerable trouble to cut down flare. Their most important technique is lens coating and this is covered in a subsequent article.

Shooting into the sun With some lenses, this will produce concentric rings of light, if the sun, or any other strong light source, is centred in the shot (left)

Veiling effect Instead of patches or rings, flare can show up as an overall lowering of contrast. This gives a shots a softness which can be attractive (right)

Sources of lens flare



Camera and lens Both contain many potential sources of flare. Blackening of interior surfaces reduces or eliminates the effects produced by some of them

Good blackening of the interior of the lens, also helps to keep flare to a minimum. Unfortunately no finish has yet been devised that is totally non-reflective and telephoto lenses in particular may suffer from a marked lack of contrast.

A good lens hood can make a substantial difference but it must cut out all light from outside the picture area but not cut off any light from the picture itself. Again, this ideal is hard to fulfil.

Surprisingly, perhaps, one of the biggest contributors to flare is dirt. Lens surfaces should always be protected from dust and especially from greasy fingerprints. A single fingerprint on the front surface of a lens can make images so lacking in contrast that they are useless. If a lens is badly marked it should be cleaned gently with well-crumpled lens cleaning tissue. But a lens which is polished repeatedly with even the softest material accumulates many tiny scratches and the surface is dulled. The result is a permanently increased flare level. So to keep flare to a minimum and retain the full contrast range in your shots, make sure your fingers never touch the lens!

Choosing a light meter

Light meters built into cameras cannot cope with all the situations that you may encounter. A separate hand-held meter helps you achieve accurate exposure under awkward lighting conditions

For most subjects, built-in exposure metres indicate exposure correctly but they can be fooled by scenes that contain extremes of light or dark or more light or shade than average. In these circumstances, the only way to discover the exposure you need may be to use a separate hand-held meter. If you have a roll film camera with no built-in meter, a separate light meter is vital.

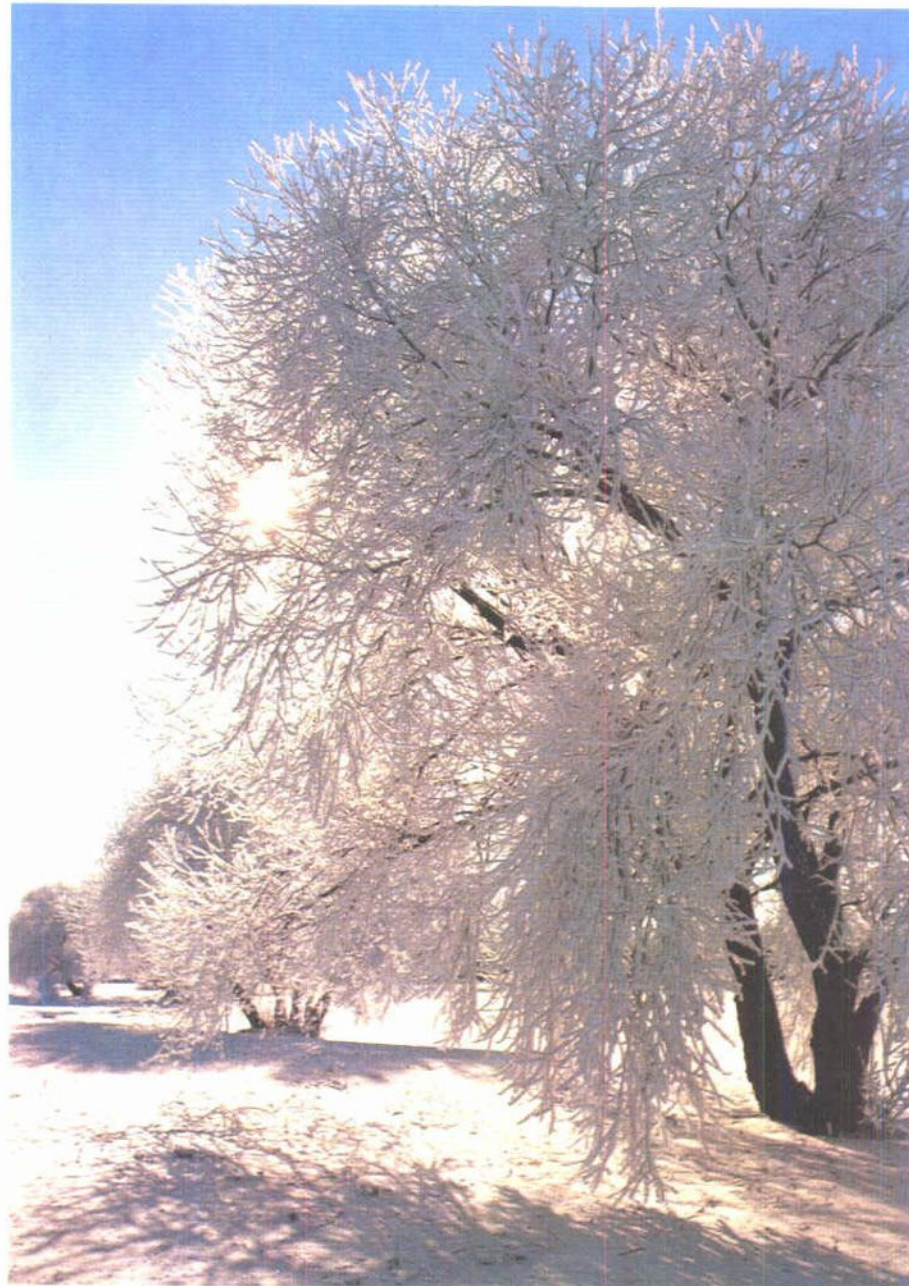
Most hand-held meters, like built-in meters, work by measuring the light reflected from the subject and their special attraction is essentially one of technique—it is simply much easier to take readings from individual areas of the subject with a hand-held meter (see pages 541 to 543). However, many hand-held meters have facilities for alternative ways of taking light readings.

Most modern meters, for instance, have a diffuser that can be placed over the meter's 'eye' to allow you to take incident light readings, readings of the intensity of light actually falling on the subject. This type of reading is normally impossible with through-the-lens (TTL) metering on an SLR.

Made from opaque plastic, the diffuser is normally dome shaped to include all the light falling on the front of the subject, but some meters have a flat diffuser. Because it has a narrower acceptance angle, a meter with a flat diffuser can also tell you the relative strength of a number of different light sources.

Some meters can be used with an accessory, to take spot readings—readings from a very small area of the subject. Indeed a few large and expensive meters, such as the Pentax Spotmeter, are designed specifically for this type of metering. With a spotmeter, you look through a viewfinder that takes in a wide view of the scene, but the reading is only taken from a small circle in the centre covering an angle of a few degrees. Spot readings are ideal for precise exposure readings from small areas, particularly at a distance, such as a brightly lit figure on a dim, far away stage. But they must be used with caution because they are calibrated on the assumption that the spot they are aimed at is typical of average brightness.

Other facilities available on the more sophisticated meters are attachments to make exposure readings for either



John de Visser

copying or enlarging. With a few meters, you can actually take readings from the camera's ground glass focusing screen though this facility is usually only used with large format sheet film cameras which have a large screen.

More unusual features that you may come across are flexible fibre optic probes—for spot readings from otherwise inaccessible parts of the subject—and adaptors for readings through microscopes or telescopes. One meter, the



Meters courtesy of Photax and Vivitar



Digits and dials Some types of meter have a motorized dial (top), others a conventional needle display (left), or a digital display (right)

reading in situations where many other meters would not respond at all, but sensitivity varies even between SPD meters, and it is worth checking that the meter gives the range you want.

Meter sensitivity

Conventionally, the maximum sensitivity of an exposure meter is given as an Exposure Value (EV) for a film of 100

Spot or universal? A spotmeter (right) is of more specific use than other types (left), which can measure both incident and reflected light

White tree When a subject is very dark or light, as here, reflected light meters can be easily misled, but an incident light meter gives accurate exposure

Gossen Profisix, can be converted into a colour temperature meter or a flash meter, and a few meters, such as those in the Calcuflash and Vivitar LX range, can be used for normal light and flash metering together.

With such a range of alternative facilities available, you may find the prospect of choosing a meter rather daunting, and unless you have any special need for a particular facility, it may be easier to select your meter on the basis of sensitivity and cost. Both of these factors partly depend on the type of photocell that the meter is based on.

Types of cell

Photocells for light meters are of three major types: selenium, cadmium sulphide (CdS) and silicon photodiode (SPD). Of the three, selenium cell meters are the most basic. They need no batteries, last for a long time and have a colour response similar to the human eye. However, they do not respond to low light levels and they tend to become less accurate as they age. Nevertheless, their low price and simplicity make them ideal for supplementing a built-in meter and one meter of this type, the Weston, has become a classic. If you are going to a remote spot where batteries are unobtainable, a selenium cell meter might prove invaluable.

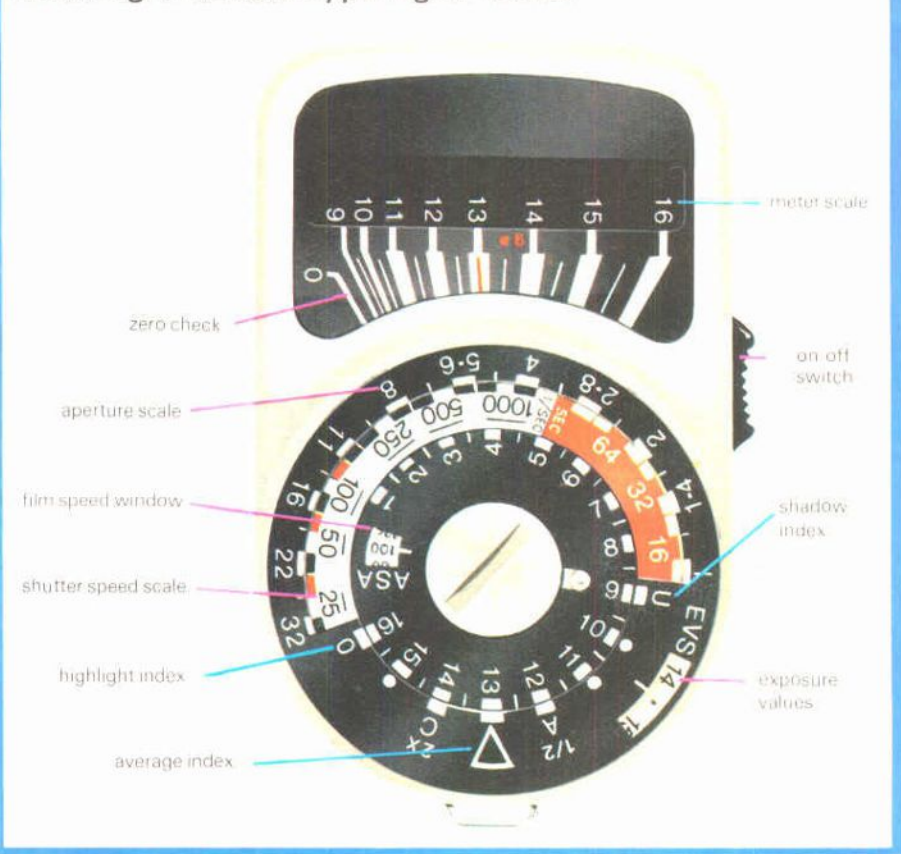
For that extra sensitivity to meter low light levels however, you need either a CdS or SPD meter, CdS meters must

Meter dial Although meter dials look confusing, operation is simple. Here a mid-tone reading gives a figure of 13 on the meter scale. The triangular index is aligned with 13 on the circular dial, and the aperture and shutter speed combinations are chosen from the concentric scales at the top left of the disc. Other markings are for shadow and highlight readings, and exposure values (EVs)

have a battery but can be small and exceptionally sensitive. Unfortunately they are a little too sensitive to red light. They are also rather slow to respond and have a memory effect that makes them over read low light levels when metered shortly after exposure to a bright scene. Not surprisingly, CdS meters are now being superseded by meters with SPD cells which are equally sensitive and have no memory effect.

CdS and SPD cell meters are not only expensive to run, they are expensive to buy. But if you plan to do a considerable amount of night-time photography the extra sensitivity may justify the expense. Although you may have to make adjustments for reciprocity failure (see pages 466)—the loss of effective emulsion speed during very long exposures—a CdS or SPD meter will at least give you a

Reading a needle type light meter





Geg Germany

In the spotlight When the subject of a picture is inaccessible, a spotmeter may prove to be the only way of getting an accurate exposure meter reading

ASA (ISO). Each exposure value is simply an expression of the various shutter speed and aperture combinations needed to give the correct exposure in particular lighting conditions. For EV of 10, for instance, exposure would be 1/30 second at $f/5.6$ or 1/60 second at $f/4$ or any equivalent combination. So the sensitivity of a meter in terms of EV is simply the correct exposure for the darkest conditions it can cope with.

While a few TTL meters on SLRs can operate at -6EV (the equivalent of two minutes at $f/1.4$ or a similar exposure), most cannot cope with EVs of less than 1 (one second at $f/1.4$, for example) and some do not operate below 3EV (1/30 second at $f/1.4$). Some selenium cell meters do not even work below 6EV (1/30 at $f/1.4$). CdS and SPD meters, on the other hand, typically give at least -2EV (eight seconds at $f/1.4$) and some give as good as -8EV (eight minutes at $f/1.4$) though for exposures this long reciprocity failure must be taken into account.

When ascertaining the sensitivity range of a meter, do not be misled by

the calibrations on the meter dial: they do not indicate the capabilities of the meter. For instance, some meter scales show exposures ranging from one hour to 1/5000 second, and $f/1$ to $f/128$. Many exposures in this range are not only impossible to put into practice: they may

also be beyond the meter's ability to measure. Such all-encompassing scales have little practical value and it is far more useful to have a reasonable range of values that are clearly legible and unambiguous even in dim light than rows of figures you never use.



Marcus Wilson-Smith; Meters courtesy Photax and Vivitar

Accessory kit This meter is the basis of a system which includes spot, colour temperature, flash, copying, microscope, flexi-probe, and other sophisticated attachments



Reflected reading *Reflected light meters work well for average subjects where it is easy to get close to take the exposure meter reading*

Scales and displays

Most selenium cell meters are permanently 'on' and do not need to be switched on to take a reading. CdS and SPD meters, on the other hand, must be switched on for every reading and often switch off automatically after a minute or so to conserve battery power. On both selenium cell and CdS/SPD meters, the reading is usually given by an arbitrary number or light value. To find out the various possible exposure settings you must locate this light value on the calculator dial against the appropriate film speed.

The meter film speed scale may be in both ASA (ISO) and DIN, but increasingly nowadays it is in ASA only. The range of

values given can sometimes be extreme—one meter shows anything from 0.05 to 800,000 ASA—but these extreme speeds are of little practical value. You will rarely need a film speed setting of faster than 3200 ASA and though the low values may be usable with printing paper and slow copying film, a much more restricted range is adequate. Ease of setting, a positive lock and legible numerals are again more important than extreme values.

Meter displays take two main forms: analog and digital. With analog displays, the reading is indicated by a needle that moves across a dial scale. Digital displays give an actual figure in a window either as a Light Emitting Diode (LED) or a low contrast Liquid Crystal Display (LCD). LEDs are luminous and can be read in the dark but are heavy on batteries; LCDs need far less battery power, but are not luminous.

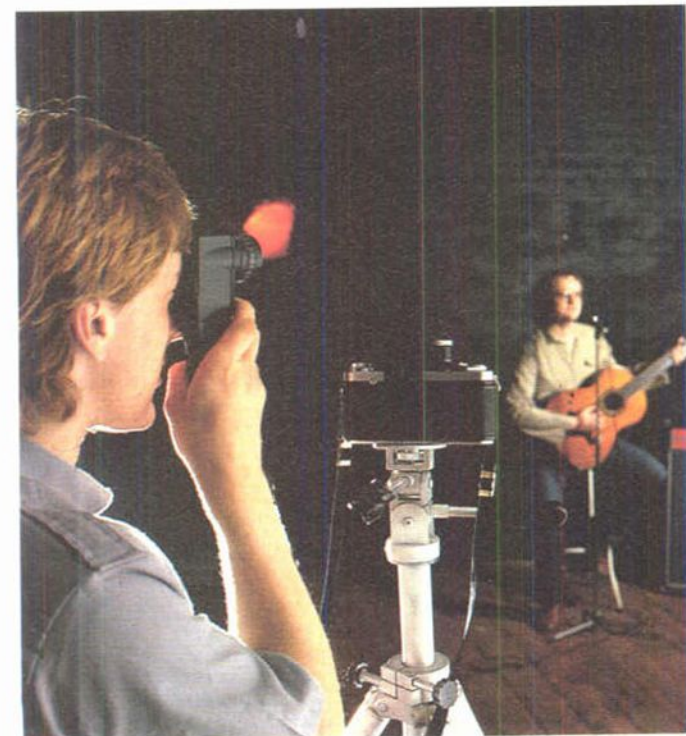
Digital displays, on the other hand, only show values to the nearest third stop and disguise smaller variations, but give the reading in clear easy to read figures on a continuous scale. They also have a memory that can store a reading for later recall. On some meters this memory can be updated every second to allow a slow scan of a scene. A few meters have servo-operated calculator dials where the light value is automatically transferred to the calculator to give an exposure value, but this is really something of a luxury.

Meter displays can take other forms besides analog and digital, but these alternatives make up only a small proportion of the market.

As with all items of photographic equipment, your final choice of light meter must be a compromise between your needs and your pocket. A selenium cell meter is cheap and reliable and works well in good light, but for low light conditions you need the extra sensitivity of the more expensive SPD meters and, if you intend to use it at night it should have a digital LED display. Clearly, a diffuser for incident light readings is a valuable accessory.

Before you buy, you must decide exactly what your priorities are. But whatever your decision, you will find a hand-held light meter not only helps you to achieve the correct exposure but also gives you a tremendous feeling for the craft of photography.

Spotmeter *Using a spotmeter, a photographer can stand back from the scene and get a precise light reading*
Incident light meter *By measuring light falling on the subject, rather than the reflected light, the exposure will be absolutely consistent, and unaffected by subject and background tone*



Ed Boxer

Ancient monument

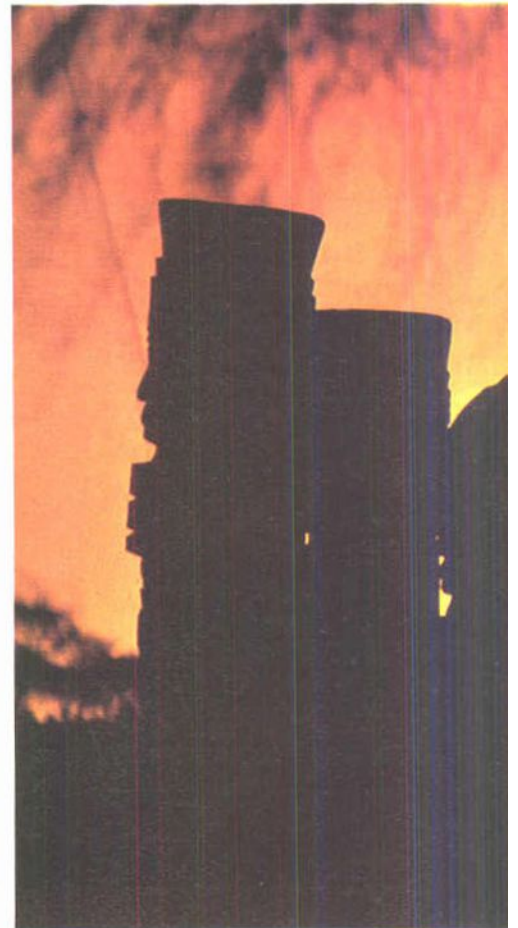
The techniques used by Sergio Dorantes to photograph a well known Mexican monument illustrate how some of the best travel photographs are gained by concentrating on places of special interest rather than on general views



The main idea of taking photographs while you are abroad is to produce a memorable pictorial record of your travels. To do this well, the photographer must find an original way of recording sights that may already have been so extensively documented that they seem almost familiar. The record must, therefore, be made in a way so that it has personal appeal but also arouses the imagination and interest of those who have never visited the location before.

One way of improving your travel photographs is to spend more time at each place you visit—even if this means stopping off at fewer places. It is much better to give more detailed coverage to two or three places of special interest than to try and take general photographs of a dozen different locations. By trying several approaches at a single site you

Nohay Paso Sergio used a 20 mm lens to relate the monument to the foreground sign. **Sunrise** Taken with a 500 mm mirror and backlighting





Sergio Dorantes

Stone face To fill the frame with a detail of one of the Tula statues, Sergio used a 105 mm lens. **Two wide angles** Sergio used 16 mm fisheye to distort the statues and a 24 mm wide angle to frame them against the sky



are far more likely to capture its true atmosphere.

For this reason it is well worth researching your itinerary with care. This involves planning a practical route and deciding which places are most worthy of a visit. By gathering information about specific places so you have a good idea of what you may meet, you are unlikely to miss out on objects of interest.

For the photographs shown here, Sergio Dorantes spent a whole day at Tula, an ancient archaeological site in Mexico. The photographs 'take the scene apart' and give the observer a full account of it. Instead of recording general impressions of Mexico, Sergio concentrated more on details which he hoped 'conveyed the essence of the place and the character of the people who built the Tula site'. A similar approach can be taken almost anywhere.

Sergio began the assignment by obtaining the permission of the keepers to photograph from various vantage points and enclosures, or to remain after hours to take pictures in different kinds of light. He explained: 'In this case, I

had to apply for a permit which allowed me to get into the site at dawn and to remain after closing time. Most authorities will cooperate with the requests of amateur photographers, but care should be paid to their instructions so that they cooperate with other photographers in the future'.

Photographing the monuments posed Sergio several problems. The ruins are located in the middle of a plain and wind blows dust and grit everywhere. 'This caused problems with the equipment and I had to be careful when changing film or lenses. Covering the camera bag with a sheet of plastic helped to solve the problem'.

Apart from the discomfort of working in temperatures of well over 30°C, Sergio also had to cope with the very high light levels from the bright sun and the reflective sand.

'I was using colour reversal film—Kodachrome 25—and the amount of contrast which this film tolerates is limited. For this reason it is vital to make intelligent exposure readings so that the film registers acceptable detail in both highlight and shadow. I tend to bracket my shots on the underexposure side for colour contrast and saturation'.

One characteristic of all of Sergio's work is the exploitation of the complete range of lenses in his system—this means choosing anything from a 16 mm full frame fisheye to a 500 mm mirror lens. Sergio even takes a 1000 mm lens

along for most assignments—just in case he finds that it offers exactly the angle of view.

Professional photography is largely a matter of delivering consistent and satisfactory results to a client—excuses are never an acceptable substitute. This becomes particularly important with any assignments carried out abroad because a reshoot can be very costly. The same applies to any traveller abroad—if your photographs do not come out satisfactorily, the same chances can rarely be repeated. For this reason, Sergio always checks and double checks his equipment and exposure readings at all stages of the day's work. This also

means not totally relying on the readings indicated by the light meters in his cameras, but also checking the light level carefully with a hand-held meter.

Sergio also had to spend a lot of time finding a 'clean' angle on the subject—the site is surrounded by wild brush.

To get the most out of the location, Sergio arrived two hours before dawn and was rewarded by a beautiful sunrise and a clear sky. Working throughout the day, he waited for the sunset and dusk to give subtle changes of light. He explained that he tried 'to obtain the sort of evocative and eerie images which created a mysterious feeling, and a personal view of these monuments'.

Exposure problems As this scene was so bright, Sergio moved in close to the central area for a light reading to avoid overexposure. **Sunset** Careful framing and a 2 second exposure made this parting shot



Sergio Dorantes

Creative approach

Seascapes

From the colour and sparkle of the sea at sunset to the irresistible power of storm waves crashing on the shore, the changing moods of the sea provide some remarkably photogenic moments. Next time you make a trip to the coast, why not explore the possibilities of seascapes?

The sea has long been a source of inspiration to writers and artists, but has more recently become a subject of fascination for photographers. There can be few photographic locations as popular as the seaside. Literally millions of seaside snapshots are taken throughout the summer by people on holiday by the sea. But the changing moods of the sea can provide far more than just

a selection of holiday snapshots.

Taking a successful seascape, though, needs a great deal of thought and care—too many seascapes are uninteresting expanses of blue, without careful framing and attention to lighting. The sheer size of the sea stretching virtually featureless away to the horizon makes it a difficult subject to handle. The combination of eye and brain delights in the

sense of vastness and space, and many people try to capture this spaciousness on film but the result rarely comes anywhere near the original experience.

Perhaps the most obvious way to communicate the sense of scale is to represent it in a direct way. You can blow up your photograph to the size of your living room wall, provided that you have achieved acceptable clarity in the



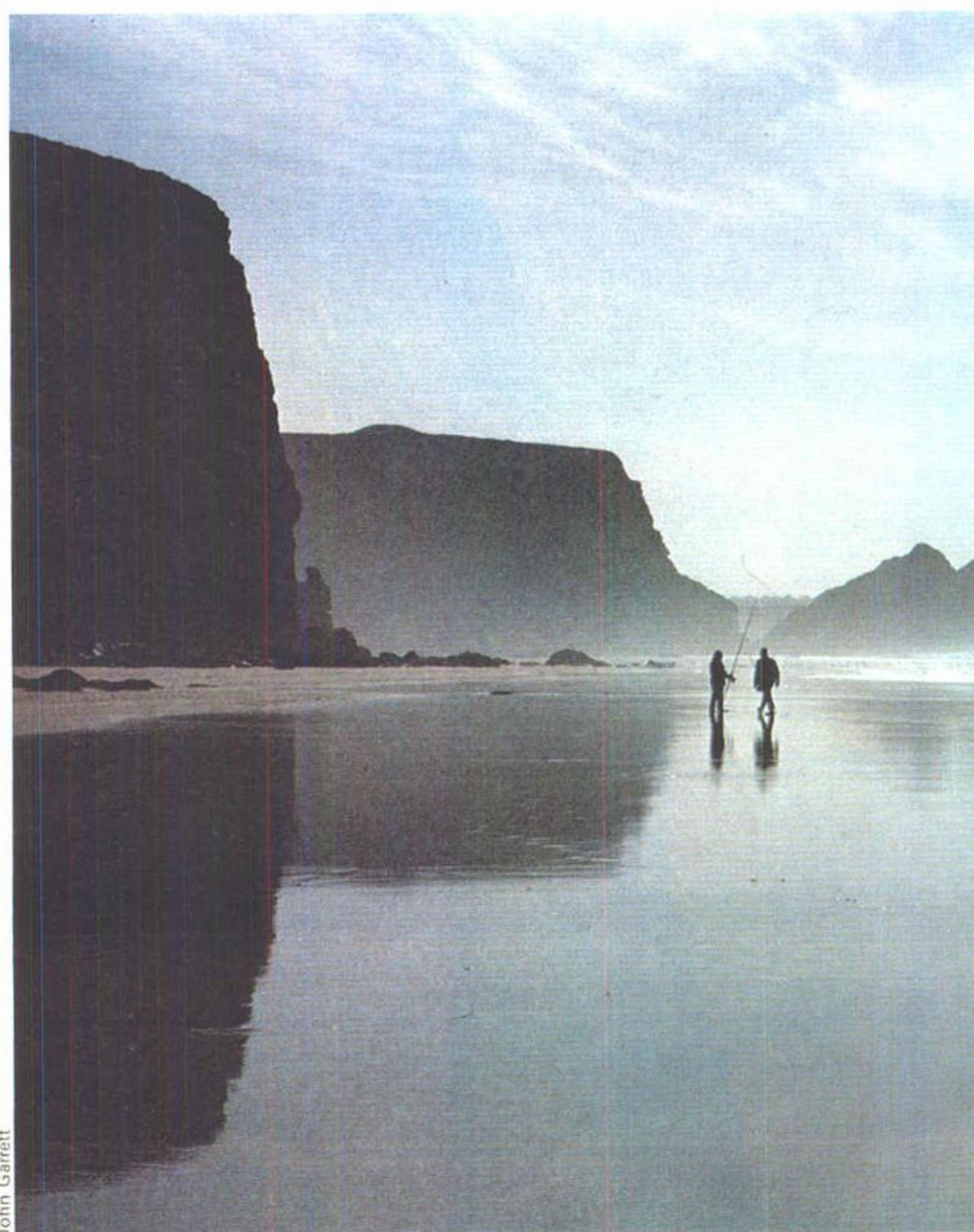
original picture. This may give the viewer the same kind of experience as being in front of the sea itself. But by including certain visual clues in the original composition, you can suggest space even in a small print.

The easiest way to suggest size and scale is to accentuate perspective, the illusion whereby objects nearer to the eye appear larger than those which are further away. For instance, in a landscape including fields in the composition, you can make use of the natural lines made by the fields as they converge into the distance to represent the depth of the scene. However, in the usual seascape such helpful devices may not be found so readily, and may have to be selected more consciously. Man-made piers, breakwaters or natural promontories are valuable features since they stretch out far in to sea.

Other objects too—boats, bathers, rocks, trees, animals or birds—if placed in the foreground of the picture can help to lead the eye into the distance and give a sense of depth to the composition. You will find that a wide angle lens, in vertical format, can be used to good effect in such photographs where the maximum depth of field is required, extending from foreground detail to far horizon. Wide vistas always look more impressive if there is something in the foreground to relate to, particularly if the object concerned has a distinctive shape.

In many pictures, trees are used to 'frame' the seascape. Although this has become something of a photographic cliché, and is seen in almost every postcard and travel brochure, the branches of the tree do perform an important function. They frame the scene into a visually satisfying shape. Try using other natural forms as a frame for your picture so that an interesting shape can be created within the composition. Look for curves in the coastline, bays and inlets, or perhaps jagged rock formations, and use them to form a shape around the sea.

At the seaside the search for a commanding or unusual viewpoint on rocky or otherwise difficult terrain may involve considerable effort. However, the right picture can make your struggle worthwhile. Bear in mind that an unusual viewpoint can make a successful picture of a commonplace subject. For instance, the colourful holiday crowds on the beach



John Garrett

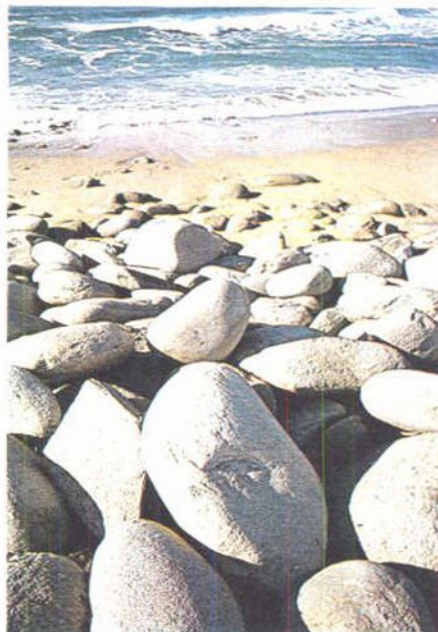
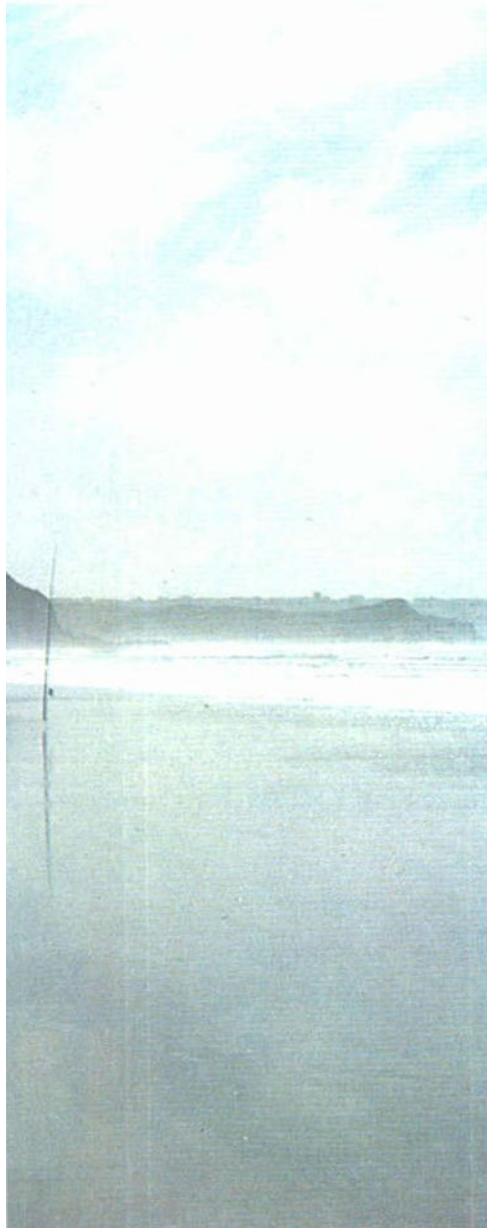


can be taken from a very high angle, perhaps a tower or cliff-top. From this position your picture will display the complex patterns made by the antlike figures swarming across the seashore and spilling into the sea. Alternatively, try a reversal of the normal viewpoint from the shore, by having the sea in the foreground of the picture and the land in the background. While this is best achieved from a boat, you can obtain much the same effect by shooting from the end of a pier back towards the land. If you are tempted to take some photographs from a boat, remember that movement, whether simple wave motion, or more disturbing engine vibration, may blur the picture unless a fast shutter speed is used.

Paul Hartmann/Sepia

A more dramatic way of photographing from the sea towards the land is to walk into the water, carefully holding the camera well above the waves. Photographing from a low angle, so that individual waves fill the foreground, can be extremely effective. However, few conditions are as harmful to cameras as salt water. Complete immersion will usually ruin a camera beyond repair. So be careful! Most professionals, when shooting in these conditions, will use underwater cameras, like the Nikonos, or protective underwater housings. It is quite a good idea while at the seaside to protect your camera from both salt and sand by keeping it in a plastic bag when it is not in use.

One way to deal with the problems involved in representing the size of the



Surfer This shot succeeds because the figure has been kept small in the frame, so the scale of the waves is retained **Cliffs** Tiny figures emphasize the huge cliffs and lead the eye into the depth of the picture

Umbrellas In this almost abstract shot shadows are used to accentuate the shape of the umbrellas which provide an interesting foreground to the sea

Buoy The sharp pink of the buoy contrasts well with the dark background

Alain Daigne/Sepia



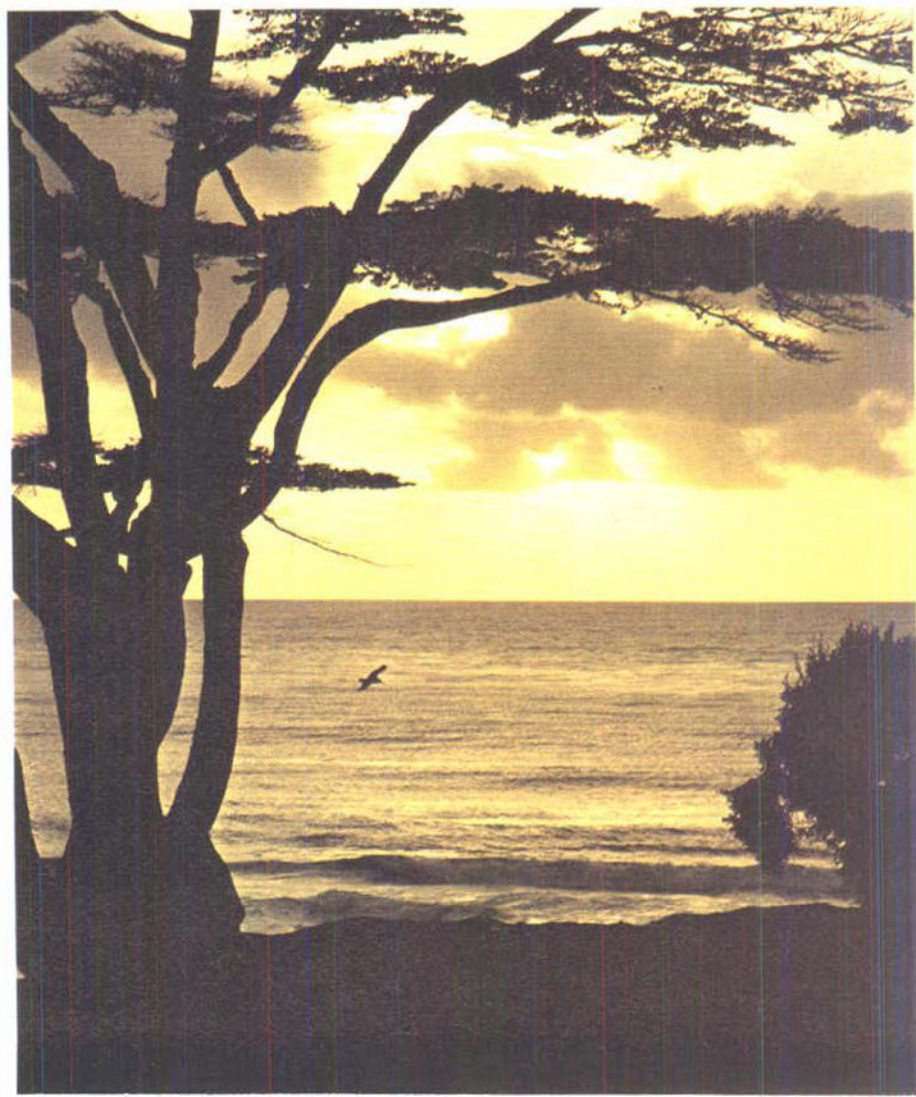
sea is to concentrate on details, composing your seascape from the smaller elements found at the seashore. In general the camera is much better at recording details than large, expansive vistas, so use this to your advantage. There are many fascinating objects to be found at the seaside which you can use in your picture to symbolize the larger idea of the sea—individual rocks, shells, seaweed, patterns in the sand, crabs, gulls or rock pools. And while you are considering these details, do not forget that the camera has a remarkable ability to recreate texture—and there are some very interesting textures at the seaside. Look for textured rock surfaces, ribbed sand, smooth pebbles and the complex ripple patterns of the water itself.

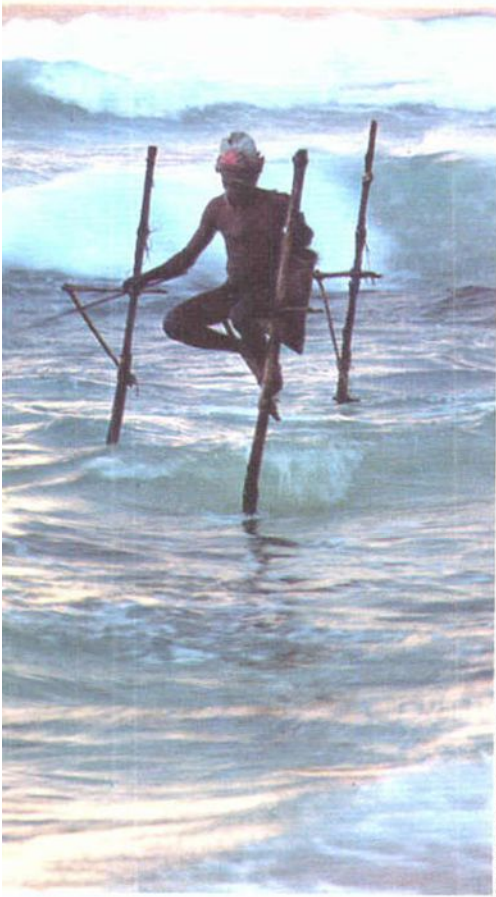
Another advantage the camera has over the human eye is the ability to freeze motion. With a fast shutter speed you can exploit this advantage and capture the very moment that the spray of surf crashes on to the rocks. In this case try to use a low angle to create more impact. Again, you may prefer to suggest the power of waves by blurring their movement with a very slow shutter speed. You will need to use a tripod for this type of shot.

The single most important factor to consider with seascapes is the quality of lighting. You may have to wait around for the sun to reach the right angle, or you may simply have to wait for the sun itself. But you should be as selective about the angle and quality of lighting as you are about the framing and composition of your subject. The textures just mentioned, for instance, are rendered most effectively when the lighting is directed from an oblique angle, skimming across the surface to pick out the fine detail.

The water itself is best photographed very early in the morning or in late afternoon when the sun is at its lowest angle. From the right viewpoint this should give the bonus of reflected light, creating a silvery pattern from the surfaces of individual waves. In fact these times of day tend to be the most favourable for photography generally. The low angle will give better modelling on foreground subjects such as rocks, and the colour of the light is noticeably warmer and softer. Photographically speaking, you can well afford to spend the central part of the day sunbathing, or catching up on the sleep you missed to give yourself that early morning start!

One particular problem of photographing at midday at the seaside is that there may be a considerable haze. Fitting an ultraviolet filter to your lens will moderate this effect slightly, and will also help protect it from salt and sand. Another useful acquisition is a polarizing filter which will give rich deep blues to the sea and sky in your picture, and cut down reflections from the water. If the weather is very dull and overcast, then probably the best advice is to be prepared for that magic moment immediately following a storm or cloudburst





Paul M. Tatopoulos/Explorer

Head and clouds This minute head in the water really gives an impression of the vast size of the sea beyond

Sunset and tree The photographer has taken advantage of the dark foreground to make a dramatic silhouette and an interesting frame for the seascape



John de Visser



Senechal/Sepia

when the sun breaks through the clouds. If you really want to photograph a seascape during dull weather, the best solution is to use colour filters to add interest to an otherwise grey day. Alternatively you can use graduated or partial colour filters which have the effect of intensifying specific areas of the picture, such as the blue of sea or sky. If used carefully, your viewers may not believe that such a dull day existed behind your photograph.

When you look at the colour content of a typical seascape under normal daylight, you will notice the complete absence of those warm colours, particularly red, which create excitement to the eye. In normal daylight you can supply the missing ingredient by working splashes of red into the overall composition—perhaps a red sail, a beach ball, or a coloured bikini. The inclusion of people, however, will change the nature of the composition. Unless they are carefully selected or sensitively placed, human figures tend to become the prime subject of a photograph. There are obvious exceptions, such as fishermen or sailors, whose presence can help to reinforce the main theme. But even here the problem is that human figures and human activity can so easily become the main source of interest, so that you are left with something closer to a portrait than a seascape.

If people are to be used at all, then perhaps the answer is to try to blend them into the scene. From a distance alone a figure can suggest the scale of natural forms without dominating them. Human forms can also be used to echo the shapes and textures of natural forms. This has been achieved with success in the work of Bill Brandt, for example, where the curves of the nude body are used to echo the curves of rock forms. But more often than not people are likely to be a hindrance, rather than a help. After all, if you consider a sandy beach as a natural form, then the presence of thousands of gaudily dressed holiday-makers, ice cream vans and litter, scarcely contributes to the impression of natural beauty.

There are ways round this problem. You could get up at dawn, when the light is more attractive and the beach may be deserted, except, perhaps, for other photographers hoping for the same effect! Alternatively, try to take a seaside holiday in the winter, which may be a good time for forlorn, windswept beach photographs.

The article so far has concentrated on creative approaches to representing the sea in a naturalistic way, but if you take the objective, non-romantic approach to its logical conclusion, then the alternative approach which follows is an abstract one. You can take colours and shapes from the scene, and try to eliminate any suggestion of natural form so that only a pure abstract design remains. The rule is to think of the end result as this provides an excellent exercise in thinking pictorially.

Toning b&w prints

Many black and white prints can be given new life or a new look by chemical toning—shades of sepia, blue and many other tones can be obtained by simply immersing a normal print in special solutions

With modern processes, black and white prints always show the image in tones of grey, but there is no reason why they should stay this way. By immersing a normal print in chemical toners, you can change the image to any of a wide variety of different colours. Applied subtly, toners can enhance the effect of a good, moody print. Applied boldly, they can transform a rather unexciting image into a winner.

One of the main attractions of toning is that you can alter the colour of the image to suit the subject. In portraits, for instance, you could use sepia or warm brown toners to overcome the rather cold appearance of a straight black and white print, giving skin tones extra warmth. Moonlit scenes, on the other hand, could be given a cool, evocative atmosphere with blue toner, or sunsets given a vivid red hue. Or you can recreate the look of early photographs by sepia toning—an approach which might suit a picture of an old cottage or an overgrown railway station. The possibilities are limited only by your imagination and your command of toning techniques. One point to remember when

choosing a print for toning, however, is that it is usually more effective with simple subjects.

Toning is carried out after the print has been made in the normal way and, with most toning processes, the work can be done in daylight. You can buy toners in ready made packs of chemicals that are simply dissolved in water for use, or you can make up your own toning solutions. Ready made toners are available in various colours, but the most popular are sepia and blue. The advantage of these commercial toners is that they are widely available and easy to use. If you intend to tone large numbers of prints, though, you may find that they become rather expensive.

Toners can often be made up from raw chemicals far more economically and, if you do make up your own toners, you can experiment with various combinations to produce exactly the effect you want. Unfortunately, it can be difficult to obtain the necessary chemicals in small enough quantities. If you do wish to make up your own baths, look for the necessary chemicals at one of the more traditional chemist's shops or one

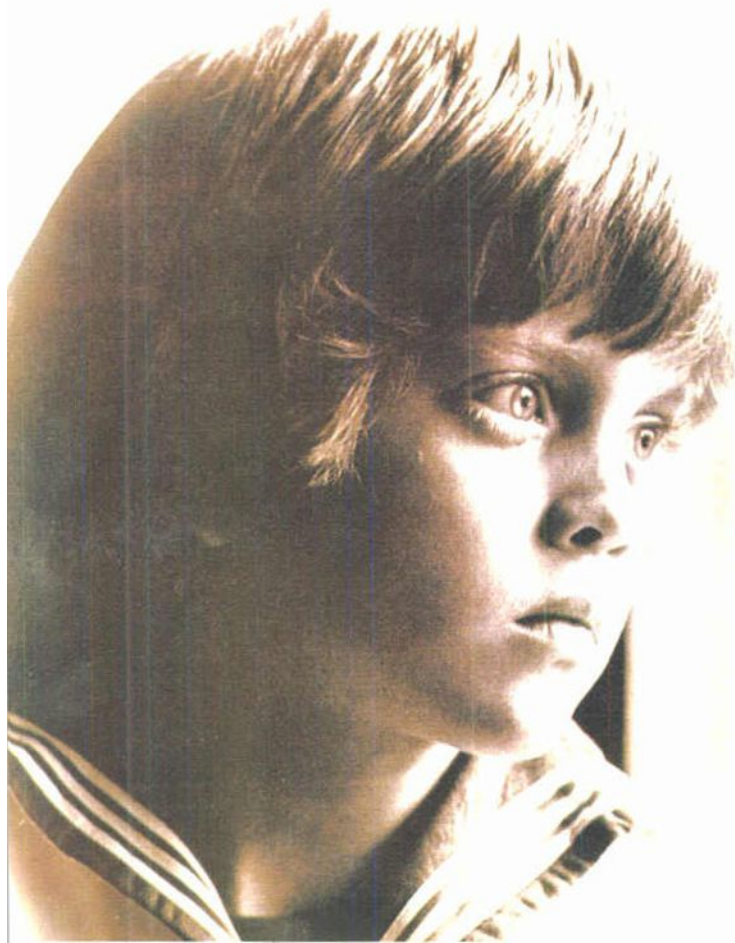
of the large photographic dealers. There are also firms which advertise photographic chemicals of all kinds in the photographic press.

Whether you buy ready made toners or mix your own, certain preparations are essential. Because different toners affect the density and colour of a print in different ways, you must adjust exposure and development to suit the tone. When making the basic print for sepia toning, for instance, an overexposed and underdeveloped print gives a yellowish tone, while an underexposed and overdeveloped print turns out a colder brown. To establish the right combination of exposure and development, make a test strip showing various exposures in the normal way and run this strip through the toner. Conduct a number of development tests as well with small prints. It is also worth preparing a number of identical prints before each session so that you can experiment to achieve precisely the right effect.

Each print must be washed very thoroughly before toning because residual chemicals can react with the toners to give a very blotchy image. The need for thorough washing varies from toner to toner but with many you should use a hypo clearing agent as a preliminary to the usual water wash. On the other hand, when using hypo alum toner, described below, a brief rinse after fixing is adequate as the toner itself contains fixing agent. If prints have been dried they should be soaked in cold water for half an hour before toning to ensure even action of the solutions.

Sepia toning

These portraits, although very different in style, both benefit from sepia toning which softens contrast and brings out shadow detail



Caroline Arber



Martin Proctor

Abstract Blue
toner gives a cool, moody effect
Girl in colour
By careful masking while applying different tones, you can combine a number of tones on a single print. For this picture, selected areas were masked while the print was sepia toned. Different areas were masked for red and blue toning
Green ripples An experiment using sepia bleach with blue (iron) toner for a green tone

Toners take different forms. There are many different formulae for producing sepia or brown tones and nearly all of them work by converting the black metallic silver in the image to silver sulphide, which has a brown colour. Its precise colour depends on a number of factors and variations of tone can be obtained with basically the same chemical process. There are also toners containing metals which give blue and green tones, dyes and colour developers.

Both dye toners and colour developers require careful handling and are dealt with in a subsequent article.

Sepia Toning

Because of the extra warmth it gives monochrome pictures, sepia is one of the most popular tones, particularly for portraits and sunny scenes. Although there are many ways of achieving a sepia tone, there are two common and easy methods: indirect sulphide toning and direct sulphide toning with a hypo alum solution.

Indirect sulphide toning involves bleaching the silver image of the print to a buff colour in one solution and, after a brief wash, darkening it to brown silver sulphide in a second bath of sodium sulphide. The chemicals given off by the second bath have a very unpleasant smell, like rotten eggs, and are also highly toxic. For your own comfort and

safety, tone your prints in a well ventilated room.

Indirect sulphide toning is also very susceptible to impurities in the water supply. Small particles of rust from iron pipes, for example, can give blue marks. If you are troubled with these you must filter the water.

Sulphide toners are generally available in kits containing a bleaching solution and a sulphide darkening solution, but you can make up your own two stock solutions if you wish. There are many different formulae for a sulphide toning bleach but all of them have much the same effect. The following bleach and sulphide stock solutions are typical.

Sulphide toner

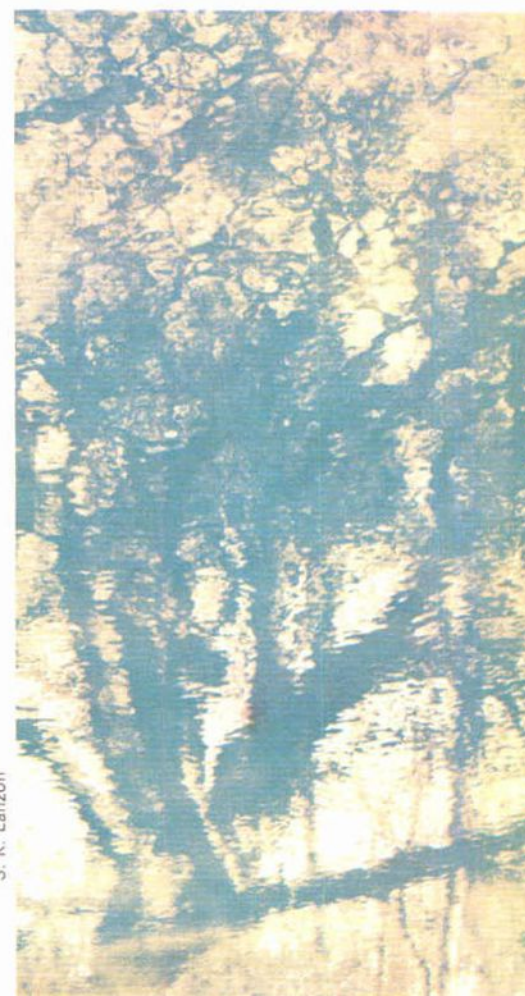
Stock bleach solution
Potassium ferricyanide 50 g
Potassium bromide 20 g
Water to make 1 litre

Stock sulphide solution
Sodium sulphide 50 g
Water to make 250 ml

The bleach solution is used undiluted and may be used again a number of times until it no longer bleaches completely. It is important to include only the quantity of potassium bromide stated—any excess can produce yellowish tones.

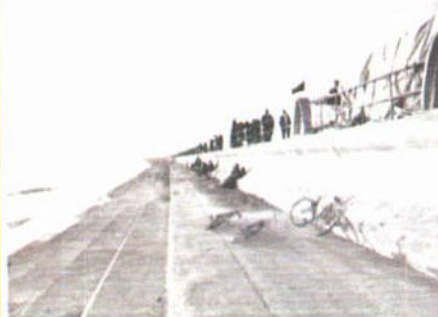
To tone the print, immerse it in the bleach solution in a normal processing dish and rock the dish gently until the image is changed completely to a pale yellow-brown or buff colour. Remove the print from the bleach when no trace of black silver can be seen—this should take less than a minute unless the bleach is near exhaustion. Wash the print for two minutes if you are using RC paper and for about five minutes with fibre-based paper.

The stock sulphide solution must be diluted 1 + 19 with water for use. The working solution can be used only once, so do not make up more solution than you need. Place the bleached and washed print in a dish containing the dilute sulphide solution to change the buff image to a rich brown or sepia colour. Rock the dish continuously, processing the print until no further change in colour is evident. Finally, wash the print



S. K. Lanson

Toning effects



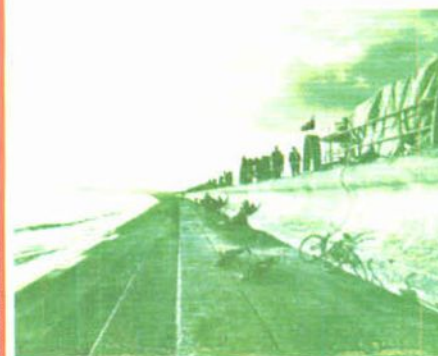
Basic print Any black and white print can be toned but it must be clean



Sepia For a warm, soft look, you can tone in sulphide or hypo alum



Red Varying toning procedure and mixing tones gives many different tones



Green Less popular but often effective, green toning requires a two part bath

for ten minutes in running water.

Do not pour the used sulphide solution down the sink, since the extra dilution increases the potency of the odour and your sink will smell foul for days. Instead, you should pour a solution of potassium permanganate down an outside drain and dispose of the sulphide solution here. The potassium permanganate effectively kills the odour.

Hypo alum toner gives a more purplish sepia tone but slightly reduces the density of the print image, so you should give the print slightly more exposure than normal. This toner is easily made up using the formula shown here; the solution is used undiluted.

Hypo alum toner

Sodium thiosulphate (hypo) crystals	150 g
Potassium alum	25 g
Hot water to make	1 litre

The hypo crystals should be dissolved in hot water at about 75°C and the alum slowly added. The solution will turn cloudy as a whitish precipitate is formed. Boil the solution for several minutes and make up a second solution. To make this second solution, add 0.14 g of silver nitrate to a little water. When the silver nitrate is dissolved add liquid ammonia drop by drop until the precipitate first formed dissolves. This second solution is then added to the toner solution. If no silver nitrate is available, the toner can be made ready for use by immersing waste prints in the solution until the highlights are no longer bleached. This toning solution should last almost indefinitely if kept in a corked bottle.

Toning in hypo alum has to be done at a high temperature, otherwise the process is extremely slow. The most convenient way of maintaining high temperatures is to stand the dish containing the toner in another larger dish filled with water at about 45°C. If you keep prints on the move with plastic print forceps, toning should be complete in 20 to 30 minutes.

After toning, fix the prints in normal fixer to remove any silver compounds taken up from the hypo alum solution and then wash in the normal way—five minutes for RC papers and at least 30 minutes for fibre based papers.

You can obtain warmer sepia tones by adding 1 g of potassium iodide to one litre of the hypo alum toner and using it as before, at a process temperature of about 40°C.

Blue toner

A single blue toning bath containing iron salts gives prints a blue tone, but because it also darkens the image, you must adjust the original print exposure and development by making the tests outlined above. The iron toning bath is made up from two stock solutions mixed without dilution immediately before use. The working solution should be discarded after each session.

Iron toner

Stock ferricyanide solution

Potassium ferricyanide	2 g
Sulphuric acid (concentrated)	4 ml
Water to make	1 litre

To make up this solution add the acid very slowly to the water; NEVER add the water to the acid. Then dissolve the potassium ferricyanide in the dilute acid.

Stock iron solution

Ferric ammonium citrate	2 g
Sulphuric acid (concentrated)	4 ml
Water to make	1 litre

To make the iron solution, again add the acid very carefully to the water (not the other way round). Then dissolve the ferric ammonium citrate in the diluted sulphuric acid.

Iron toner is very simple to use but the print must be prewashed for about an hour. To be certain that the print is completely clean, use a hypo cleaning agent. For toning, the print is simply immersed in the solution while the dish is rocked.

Green toner

Green toning is slightly more complicated than blue toning and involves one bath containing three stock solutions mixed immediately before use, followed by a second bath in the toner itself. The first bath turns the print blue and the print only acquires a greenish tone in the second bath.

Green toner part 1

Stock Solution A

Ferric ammonium citrate (green)	50 g
Cold water to make	1 litre

Stock solution B

Potassium ferricyanide	25 g
Cold water to make	1 litre

Stock solution C

Hydrochloric acid (concentrated)	10 ml
Cold water to make	1 litre

To mix up the three solutions for use take 550 ml of water and then add 75 ml of solution B and 300 ml of solution C.

Tone the print in the first bath for about half a minute at 20°C and then wash it until all the highlights are clear.

Green toner part 2

Water (very warm)	500 ml
Sodium sulphide	75 g
Sodium thiosulphate (crystals)	500 g
Cold water to make	1 litre

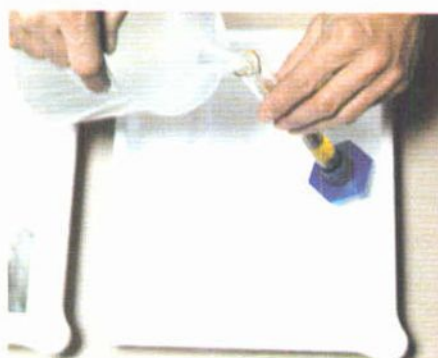
Dilute this solution 1 + 10 with water to use it and, just before you begin toning, carefully add 300 ml of ten per cent hydrochloric acid to each litre of diluted toner. Once mixed, this bath will not keep.

To continue the green toning process, immerse the blue toned and washed print in the part 2 solution until the print is the colour you want. Finally, wash the print in running water for 30 minutes.

Using sulphide toner



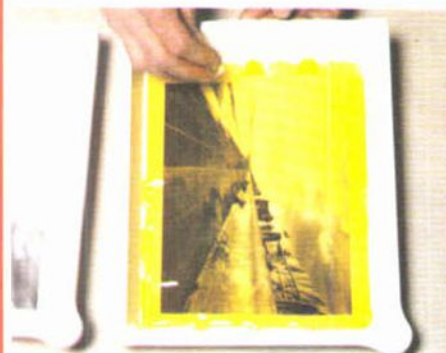
1 The Tetenal sepia toning kit is widely available and easy to use. It consists of concentrated liquid toner and a bleach solution



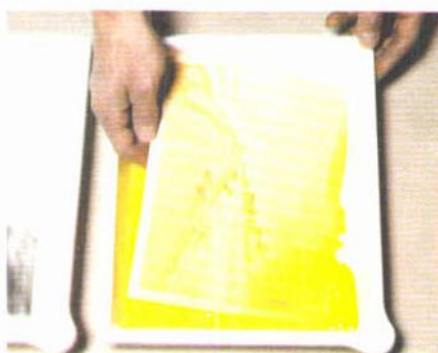
2 Start by diluting the bleach 1 – 4 with water, just before use. Prepare only as much solution you need to cover the print in the dish



3 Soak the print in warm water for five minutes before toning. This helps to ensure even toning and prevent blotches and streaks



4 Slide the print into the dish containing the bleach, gently agitating either with your fingers or by lifting opposite corners of the dish alternately



5 Continue bleaching until all the black silver image has been turned to a light yellow-buff colour—if in doubt, go on bleaching, since this can do no harm



6 Wash the print thoroughly in running water. If the dish is placed in a large sink for this stage, drainage should present no problem



7 Mix up a similar quantity of the toning solution, diluting it 1 – 4 with water. Filter the water first if it contains impurities



8 Place the bleached and rinsed print in the dish containing the toning solution. The toner acts gradually on the image, turning it sepia



9 Finally, wash the print thoroughly and dry it in the normal way. Dispose of the used sulphide solution in an outside drain

Combining tones

By covering different areas of the print while using different tones, you can give a print quite a few different tones. You could, for instance, cover the sky in a verdant landscape while toning in green toner and then remove the sky cover and cover the landscape while toning the sky blue.

The best material for covering the areas to be protected from toner is stabilized rubber latex—one of the

commonly available latex glues will do. Paint the milky white latex on to the appropriate areas of the print and wait for it to dry to form a waterproof rubber coating. You can speed up the drying process by breathing on the latex.

Once the mask is dry you can begin to tone, applying the toner with plugs of cotton wool or a fine sable brush. When the toning is complete wash and dry the print and clean the latex off the print by rubbing with the fingers. Repeat this

process to apply tone to other areas.

As with many darkroom techniques, the potential for toning is limited only by your imagination once you have mastered the basics. But beware of the temptation to tone every print—once all your prints are sepia toned, they will be no more exciting than if they were all black and white. Choose your prints carefully, and only tone those that would really benefit from it. On the right print, toning can make all the difference.

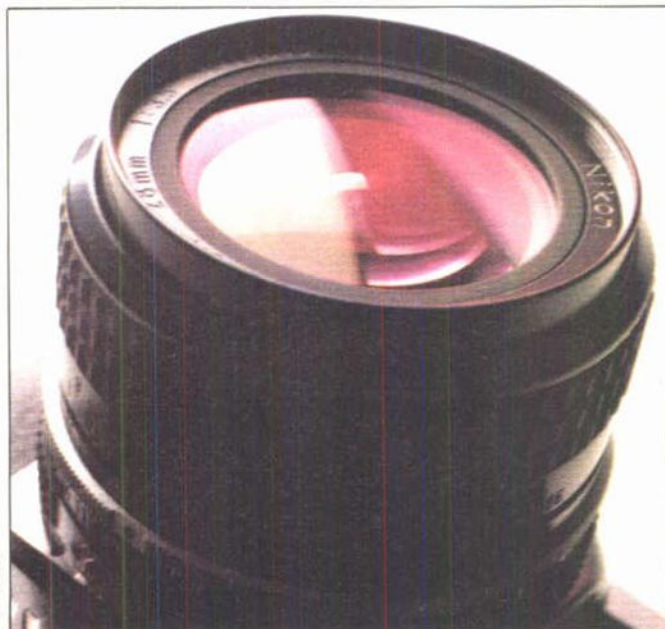
Lens coating

The colourful sheen visible on the glass surface of most modern lenses is a special coating that plays a vital role in cutting down flare

If a camera lens is to produce bright, high contrast pictures with saturated colours, it must be free of flare. A lens that suffers from flare forms images in which contrast is low, and the shadows are pale and insipid. When a strong bright colour dominates the picture, the shadows pick this up, and the whole frame becomes suffused by the dominant colour.

It is possible to reduce the amount of flare by using a lens hood, or by carefully blackening the metal parts of the lens barrel during manufacture, but a large part of the flare is caused when light actually passes from the air into the glass components of the lens.

Each time the rays of light pass from air into glass, or back out to air again, a certain amount of light is lost—usually about four per cent. Although this may not seem significant, the loss of light takes place at every air to



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Rainbow colours You can usually identify a multicoated lens by the coloured reflections from the coated surfaces

Uncoated and coated Without coating, excess flare means low contrast (below left); contrast is much better with a coated lens (below right)

glass surface. A simple lens, such as a close up supplementary lens, has two surfaces, and loses only about 8 per cent of the light that strikes it, but today's zoom lenses have ten or more elements. This means that there are as many as 20 air to glass interfaces where light is lost. If plain glass elements are used, only 30 per cent of the light that enters the lens actually emerges at the other end to form an image of the subject.

The light that bounces off the lens at each interface does not actually disappear. Some of it is reflected back out of the lens towards the subject, and some of it is absorbed by the black matt paint and anti-reflection grooves inside the lens barrel. Much of this light, though, eventually reaches the film, causing flare and degrading the quality of the photographic image.

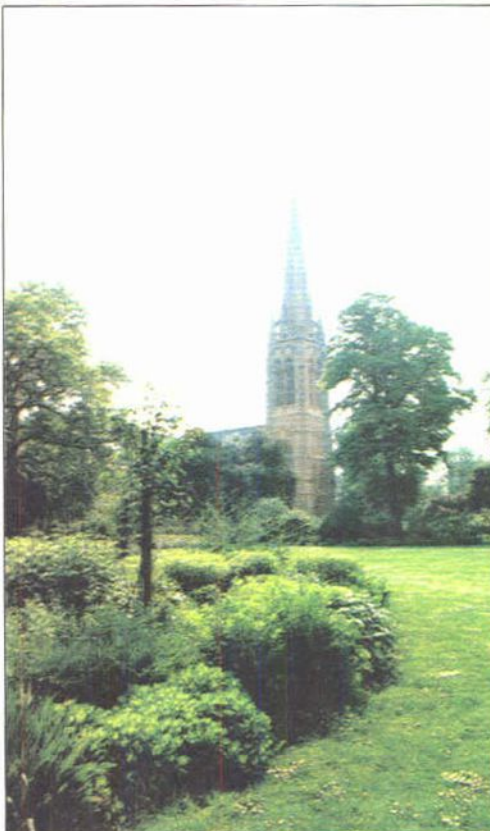
Early photographers preferred to use simple lenses using just a single glass element. With only two air-glass interfaces, these lenses had very little flare compared with more complicated designs. Soon, however, it was noticed that lenses that had tarnished, and developed a natural bloom, produced less flare than new, unbloomed lenses. This thin coating actually reduced flare, and caused the lens to transmit more light.

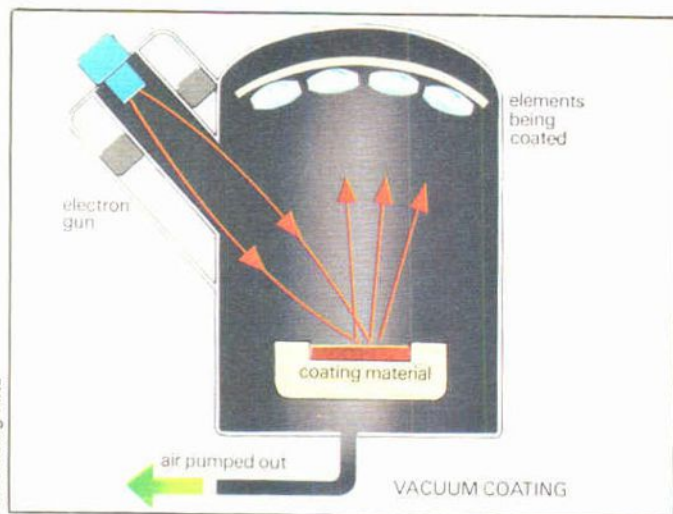
Modern lenses are artificially coated with a minutely thin layer of magnesium fluoride, and other substances. These thin coatings cut down flare and increase contrast. To be effective, the thickness of the film must be exactly equal to one quarter of the wavelength of light—about one ten thousandth of a millimetre—so the coating process must be very precisely controlled.

Uncoated elements are fixed into a special pressure chamber from which air is removed by a vacuum pump. The coating material is contained in a small crucible at



Ed Baxter





the bottom of the chamber which is either heated, or bombarded with an electron beam. Small amounts of the coating material evaporate, and are deposited on the glass surface of the lens elements.

How coating works

Lens coating relies on the phenomenon of *interference*. This is the effect that is seen when two waves with the same wave length combine. When the peak of one wave combines with the peak of the other, *constructive interference* takes place, and the two waves reinforce each other. If the peak of one wave, on the other hand, coincides with the trough of the other, the waves cancel each other out. This is called *destructive interference*.

When light waves approach a coated lens surface, the first wave peak passes through the coating, and some is reflected on the far side by the glass surface of the lens. The reflected light travels back through the lens coating, but is reflected again where the lens coating meets the air. At this moment, the first wave peak has travelled twice through the thickness of the lens coating. Since the coating layer is a quarter of a wavelength thick, it has travelled half a wavelength farther than the unreflected wave peak that follows. Half a wavelength is the distance from a wave peak to a trough, so the reflected wave peak lines up with the trough that follows behind. This causes destructive interference, and the reflected wave is cancelled out.

In this way, lens coating

cuts down the amount of light reflected, but also reinforces the light that passes through the lens to form the image. The result is a dramatic increase in contrast, greatly reduced flare, and much higher transmission of light.

A coated lens with six elements transmits about 98 per cent of the light falling on it. Without coating it would transmit only 60 to 70 per cent. Modern lenses are extremely complex in construction, and zoom lenses with as many as 20 elements are not unheard of. Without lens coating, such lenses would be totally impractical, because it would be impossible to control flare, and very little image forming light would reach the film.

Uncoated lenses would be restricted to four or five elements, and this would rule out most wide angle lenses for 35 mm cameras. Even quite conventional lenses such as the 50 mm standard lens would not produce such good results, because almost every modern lens has to use many elements to reduce the number of aberrations.

Multicoating

Lens coating is only effective for one wavelength of light, but white light is made of a whole range of wavelengths throughout the spectrum (see page 198). Although a single coating considerably improves the transmission of light through a lens, it does so for one colour of light more than the others. By coating two layers on to a lens element, each layer a slightly different thickness, it is possible to cut down reflection and flare even more.

Multicoating, which is now

Coating by evaporation

The coating material is bombarded with electrons. It then evaporates to form a thin layer on the lenses

quite common, may involve as many as six or seven different layers on each glass element of the lens. Every layer cuts down the reflected light of a particular colour, so transmission of light is improved right across the spectrum.

Limitations of coating

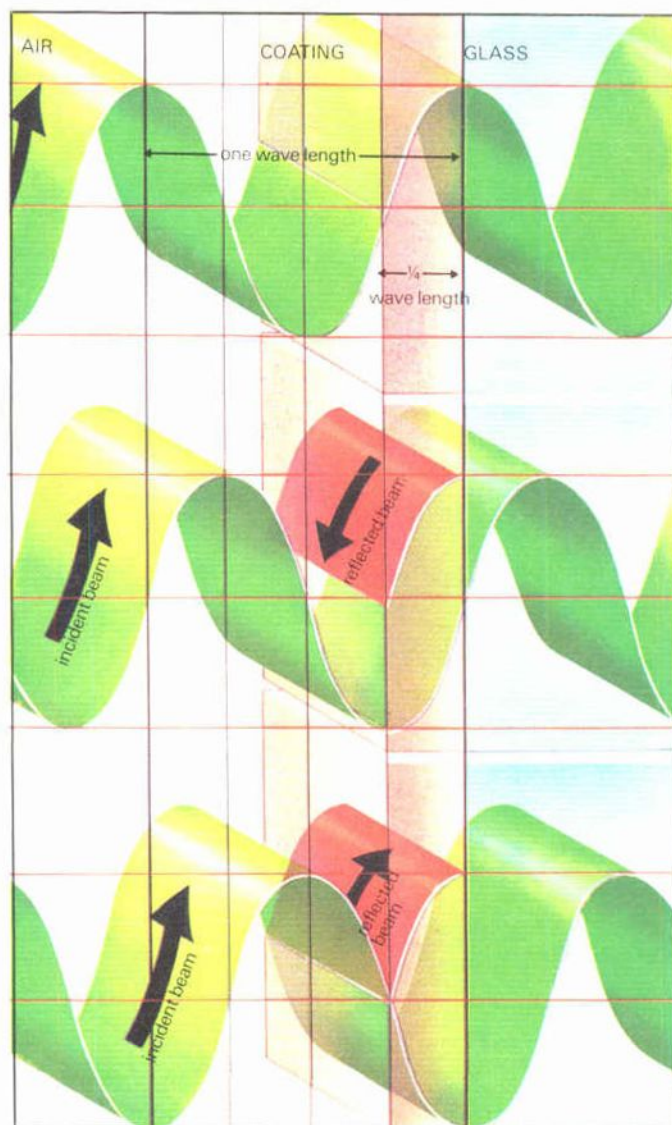
Coated lenses are a vital contribution to good image quality, but coating cannot eliminate non-image forming light which is scattered by a dirty or scratched lens. Although it is important to keep a lens surface free of dust, a coated lens should be cleaned with great care. Lens coatings are quite hard and resilient, but grit on a cleaning cloth can easily scratch

the coating, and even the glass underneath. Lens elements can be repolished and recoated, but this is costly.

Lens coatings cannot prevent reflections from imperfectly blackened surfaces inside a lens mount or camera body, so even a multicoated lens can suffer badly from flare if the manufacturer has skimped on other aspects of lens production.

Even the best multicoated lenses still suffer from ghost images when there is a bright light source in the picture. This is often unavoidable, unless a lens of simpler construction is used.

Light waves Part of the light entering the lens is reflected back at the coating-lens interface. It is reflected again at the air-coating interface. The peak of the twice-reflected light coincides with the trough of the main light



World of photography

Cecil Beaton

Sir Cecil Beaton combined remarkable photographic talents with a successful career as writer and stage designer

When Sir Cecil Beaton died in January 1980 aged 76 he was known to people all over the world as a photographer, writer, artist and stage designer. He had published 32 books, won America's highest fashion award for his costume designs, and seen his photographs published in books and magazines throughout the world.

His fame as a designer and artist was considerable but it was through his photography that he first gained universal recognition—and it is his photographs for which he is best remembered. At a time when portrait and fashion photography had become static and

conventional, Beaton's original approach blew a fresh breeze through the world of professional photography.

Beaton's enthusiasm for photography was sparked at an extremely early age. As a very young child he loved the flattering theatrical postcards of the day. When he was only a few years old, he had been shown a postcard of Lily Elsie, a famous music hall star, which affected him profoundly.

It showed her in *The Merry Widow*.

Double portrait Typical of Beaton's unusual approach to portraiture is this picture of the writer W. H. Auden in 1930



Cecil Beaton Photograph/Courtesy of Sotheby's Belgravia





Cecil Beaton



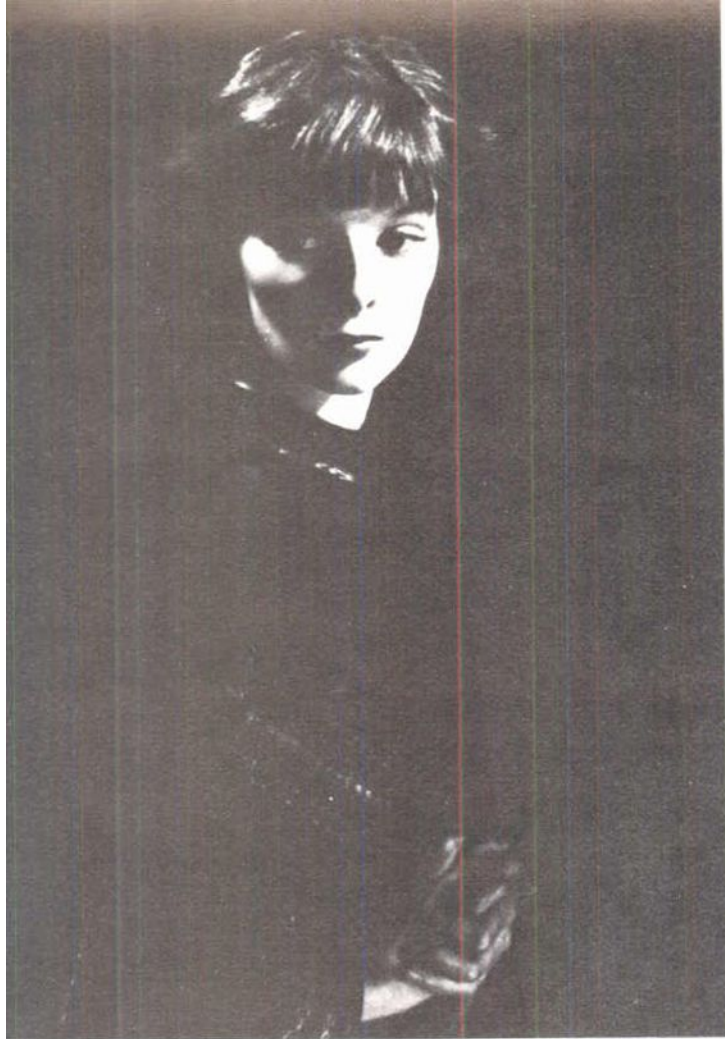
Self-portrait *The elegance and style that was a hallmark of Beaton's work shows even in his self-portraits*

Baba and friends 1928 *Beaton's sister and two friends pose for an early and theatrical group portrait*

'She was taking London by storm, as the phrase had it. She was proffering this very beautiful swanlike neck and profile. The diamonds round her neck and in her hair had been touched with silver paint, and her cheeks were slightly rosy coloured. I thought I had never seen anything so beautiful. This picture, and others like it, woke my interest in the theatre and in photography at the same moment.'

Once stimulated in this manner, his imagination worked on the twin ideas. At the age of eleven he was given a simple camera, and with the assistance of his sisters' nurse, he learned how to develop and print films. Very soon his two sisters became his first models. Other members of the family, and friends who called, had to perform the same service. Technique was not his strong point. What mattered to him was the background, the setting, the lighting and the viewpoint. He was after an effect, a certain mood in a picture.

Beaton's love of photography continued throughout his schooldays when he was to meet such contemporaries as Evelyn Waugh, George Orwell and Cyril Connolly—all later to become famous as writers and critics. During his time at Cambridge University, too, his photographs continued to show a considerable amount of promise and originality. A picture of George Rylands playing the title role in Webster's *The Duchess of Malfi*, was accepted by *Vogue*. It earned him thirty shillings and gave him a picture credit—'Photograph by Beaton'.



Katharine Hepburn 1934 and 1969 During his long and distinguished career, Beaton took portraits of celebrities in both youth and maturity—(above) his masterly use of lighting reveals the changes that have taken place in the actress's personality and appearance over the years



To his father, who had a timber business, the idea that his son should become a photographer seemed ridiculous. So Beaton was put to work in an office job to which he was singularly unsuited. His mind and his talents were unused and he continued to be fascinated by famous, beautiful and interesting people whom he was determined to photograph.

Through an ever widening circle of friends and sitters, he was introduced to the poet Edith Sitwell, a dominant figure in the literary world whose patronage was extremely encouraging and influential. He photographed her many times in the oddest poses which suited her unusual features. To be photographed by Cecil Beaton she said 'was Chinese torture'. But he noted in his diary that he caught 'an approving twinkle in her eye as she left. It meant that we were going to be friends'.

By now the whole idea of a career in business had been abandoned, not only by Beaton himself who had never entertained it, but by his father. He set up his studio in Sussex Gardens in London where he took a series of unusual, but strangely flattering portraits.

Beaton always took immense care with every detail of the setting. He chose not only the materials but every object that he included in the picture, and he painted the backgrounds himself. The effect was calculated, theatrical and decorative. In this sense he was alluding, perhaps unconsciously, to the sense of magic he had felt on seeing the theatrical postcards, but there was an important difference. He had a very modern eye, and however bizarre his props might be, or the poses he asked his sitters to hold, they always worked. All the elements in the picture contributed something. The whole became greater than the sum of the parts.

A look at the pictures taken at this time—his sisters Nancy and Baba taken in 1924, a young and startled Daphne du Maurier in 1926, Edith Sitwell on the floor in 1927, or the double reflections of the poet W. H. Auden and of Fred and Adele Astaire, both made in 1930—shows them to be far from sensational. Yet before Beaton stirred it up, portraiture had congealed for many years like cold porridge.

The conventional portrait, whether in fashionable studios or the smaller establishments of local photographers, was competent, predictable, and entirely unimaginative. Photographers aimed to make as flattering a likeness as they could manage—a memento fit for the mantelpiece, the parlour or the top of the grand piano. Serious faces tended to look stuffy, or even stuffed. Smiles look strained or stretched. Only in snapshots did people look lively, or at least real. Cecil Beaton, by approaching everything in a fresh, unconventional way,

Greta Garbo 1946 Taken at the height of Beaton's relationship with the famous but unpredictable star



challenged the formal approach to photographic portraiture.

In 1926, after sending more of his photographs to the editor of *Vogue* in London, Beaton received the following letter: 'Dear Mr Beaton, I am very favourably impressed by the photographs which you have sent me and really think that some day you will be an excellent photographer . . .'

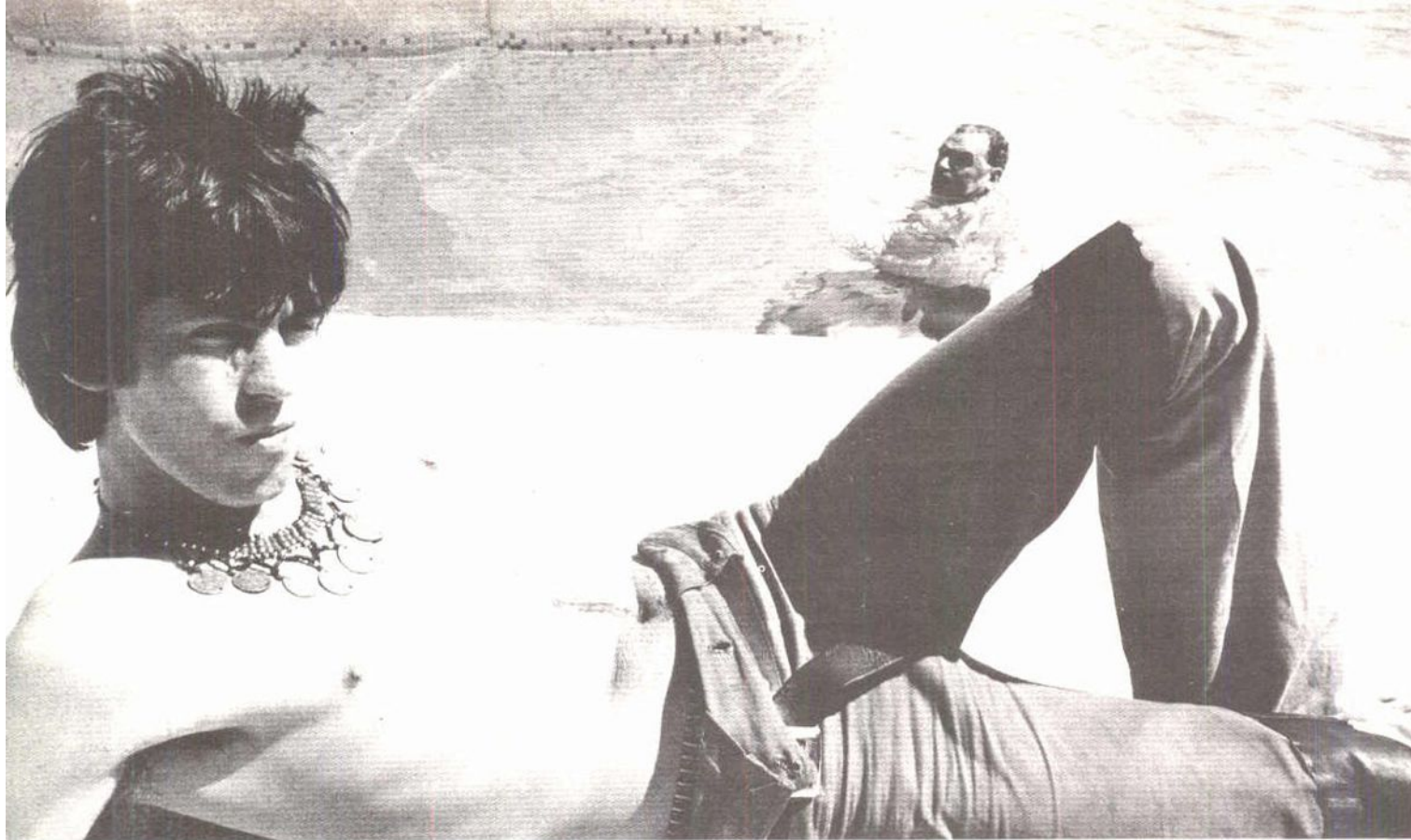
He was also encouraged by Mrs Edna Chase, the formidable editor of *American Vogue* who, on a visit to London three years later, remarked that his photographs were 'obviously amateur, but personal and interesting.' Before returning to America she told him that she would love him to do some work for her if he ever came to the States.

The invitation was irresistible. Beaton set off for New York in November 1929, with a total capital of £200 and many letters of introduction from his friends. At once he set about collecting the materials and props that were the hallmark of his photography. His sitters,

Noel Coward 1943 A stylish and dramatic portrait capturing both the elegance and intensity of the writer

at first only a few wealthy hostesses intrigued by this young English photographer, were pleased. On seeing the pictures, Mrs Chase arranged for him to take photographs of celebrities for *Vogue*. Six months later he was able to return to England with a contract to take exclusive photographs for *Vogue*. At one point in New York he had had only \$20 left, but now he had an annual income of several thousand pounds.

In the past, *Vogue* had employed two photographers whose work influenced Beaton in different ways—Baron de Meyer and George Hoyningen-Huene. Beaton admired de Meyer for his subtle use of backlighting and a mixture of sharp and soft focus which gave all his photographs a special luminous quality, and Huene for his relish of fashion and decoration, and for his innovative and imaginative pictures of models lying on



the floor. Although Beaton thought highly of their work, and adapted some of their methods to his own photography, he was original in his own ideas—sometimes too original. By 1937, eight years after she had first commissioned him, Mrs Chase, was writing in these terms.

'You say that you do not wish to do anything inelegant or ugly and that you feel that you never posed people in ugly or inelegant poses. We find this a little difficult to agree with. For example the ladies hanging on hatracks with their arms in distorted positions and their faces almost in a grimace of pain. There seems to be no realism in this unless it is the realism of a hanging—but certainly it is not elegant.

'Again, the lady on the park bench, covered with leaves and sleeping amidst a dump of half-worn shoes. What is there beautiful or elegant in this picture? Can you explain it? As I told you yesterday, I am perfectly willing to do enough new and amusing stunts to keep you happy and to keep Vogue leading the band—but I don't want to be so damn far ahead of the band that we find ourselves with an isolated following of about five thousand sophisticates. You must believe that I know what I am talking about. Edna.'

Although he had wanted to photograph the regal figure of Queen Mary, the wife of King George V, his enquiries had met with a rebuff. He was more successful with George's successor, Edward VIII who gave up his throne in December 1936 for love of Mrs Wallis Simpson to become the Duke of Windsor. Beaton had previously met and photographed Mrs Simpson, and it was no surprise when the Duke asked him to France to take a few portraits of her. The Duke was

so pleased with the results that he secretly asked Beaton back to photograph him and his wife on the day before their marriage. Beaton thus secured a dramatic 'scoop'.

Beaton travelled very widely but after visiting many countries he worked in

Keith Richards 1967 Even in his later photographs Beaton showed that he could capture the spirit of the times

Bomb damage 1940 Confronted by ordinary people coping with the war, his work acquired a new directness



Cecil Beaton Photograph/Courtesy of Sotheby's Belgravia

America again for *Vogue*. At this time he at last abandoned his small folding Kodak 3A and took up a 10 × 8 studio camera but his reputation for stylish portraits remained. Returning to London in July 1939 Cecil Beaton was at once asked by a lady-in-waiting if he could photograph Queen Elizabeth (now the Queen Mother) on the following day.

Instead of the usual brief sitting, the Queen allowed him several hours of her time. The pictures made on that occasion—in various state rooms, in the gardens and by the lake at Buckingham Palace—are among the finest of his royal photographs. Many more were to follow.

Curiously, Beaton had not anticipated the arrival of war. But after war was declared in September 1939 he tried all kinds of voluntary jobs before obtaining an appointment with the wartime Ministry of Information. He was given an open brief to take pictures of everything that could be used for news or propaganda, and this resulted in an inevitable change of style. Faced with the harsh realities of everyday life and the courage and plight of ordinary people, Beaton responded with insight, sympathy and understanding.

He had by now a fully trained photographer's eye and an instinct for a good picture. He applied both with telling effect. When *Life* used his photograph of a child with a bandaged head, the result of the blitz, this one picture was credited with gaining a vast tide of sympathy in American opinion.

After the war was over Beaton continued to work as a fashion photographer for *Vogue* and the late 1940s were one of his most successful periods. This was also the period of his long but ultimately unfulfilled relationship with Greta Garbo, who he had first met in Hollywood in the early 1930s.

By the early 1950s Beaton was again reassessing his career. He wrote in his diaries, 'Enough of taking fashions on young models who survive just as long as their faces show no signs of character, or of elderly but rich harpies appearing as if butter would not melt in their mouths.'

'I cannot give up photography: it is an important part of my life, but perhaps I can be strong enough to turn down offers that are no longer a challenge.'

But by the time Beaton was applying these strictures, fashions in photography had also changed. In the mid 1950s Beaton's contract with *Vogue* was terminated, and he worked instead for *Harper's Bazaar* in New York taking portraits of a variety of personalities, such as Marilyn Monroe and Carson McCullers. These portraits reflect the change in his perspective. By now he was more interested in the true personality of his sitters than in the image they projected to the world.

He also turned increasingly to royal portraiture, but these later pictures, good though they undoubtedly are, were no advance in manner or style on those he had made of the Queen Mother in 1939. Although still involved in his



writing and in publishing his diaries. Beaton now turned his attention more and more to designing for films and theatre and even interiors. His triumphs, in designing sets and costumes for *My Fair Lady* and *Gigi* were to give him a satisfaction that he no longer gained from photography.

His success as a photographer came early in his life. It came about because he was not afraid to break new ground and to reawaken a portraiture that had grown stale and lifeless. He was able to do this because he realized the camera's ability to halt the march of time—'to preserve', as he once put it, 'the moment like a fly in amber'.

In the introduction to one of his books, *The Magic Image*, he emphasized this, stating that it was one reason that people find old photographs so fascinating. No other medium is able to hold onto the one particular moment when a bus drove down the Strand on a winter's day. In the photograph, 70 or even 100 years later, the faces in the bus can still be seen, and the man on the pavement is caught

Aldous Huxley 1936 A simple effective device adds an extra dimension to this portrait of the author of 'Island'

'forever tying his shoe-lace, and the old woman exhorts the passers-by to buy her bunch of violets. These personages are all long since dead, but, in a small but accurate way, they live for always'. Beaton's own photographs speak eloquently of this unique quality.

Beaton's first photographic exhibition, a sensation in its time, was in 1930. By 1968 when the vast exhibition *Beaton Portraits: 1928-68*, was held at the National Portrait Gallery in London he was accepted as one of the 20th century's great photographers.

Every day the exhibition was packed by a wholly new generation—a generation familiar with, and at one with photography. The very reason for this is because pioneers of 20th century photography—and Beaton was certainly one of the foremost—learned how to make photography entertaining as well as instructive, witty as well as wise.

Viewfinders

There are bound to be times when you find it hard to focus—in dim light, for example, or when in awkward positions. If this happens often, changing your finder or screen may help

The pentaprism and standard focusing screen that are fitted to the average 35 mm SLR are ideal for everyday photography: when used with the standard lens, the image in the viewfinder is similar in scale to that seen by eye and is easy to see, while focusing aids make it easy to get a sharp picture. The viewfinder is bright, and the image snaps clearly in and out of focus.

Despite the ease with which this combination of screen and finder can be used, an increasing number of SLRs are built to accept interchangeable screens, and about half a dozen have interchangeable finders available. Those that do not usually accept a series of viewfinder magnifiers and accessories to increase their versatility. But if you only ever use a standard lens, or never take pictures at low or awkward angles, you may wonder why some photographers prefer to use special viewing systems.

The reason is simple—the standard focusing screen is designed to work best with lenses that have a focal length of about 30 to 90 mm, and a maximum aperture of between $f/1.8$ and $f/2.8$. Outside these ranges, slightly different screens make focusing simpler. Different viewfinders are useful when the camera is to be used at a very low or high angle, or under difficult circumstances—when the photographer has to wear a safety helmet, for example, or when the camera is in an underwater housing. Special finders that greatly enlarge the image of the screen are available as well for high quality work



Changing the screen

Not all cameras can take interchangeable focusing screens, and those that do may only offer a choice of two or three different types. On the other hand, some camera systems have as many as 20 screens available for their top models.

Focusing screens are changed in one of two ways. The camera pentaprism may be removable, giving access to the screen. The screen either rests in a

trough under the prism, or is clipped to the underside of it. Either of these two systems make screen changing quite straightforward. The alternative, which is adopted when the pentaprism is fixed, is to arrange for screen changing through the throat of the camera. The lens is first removed and the screen released by either moving a catch, or pressing back on it. The screen can then be lifted out. This system is considerably harder to use, and usually requires tweezers. Great care must be taken because dirt and fingerprints easily stick to the surface of the screen, and can prove impossible to remove.

Cameras that take meter readings from the surface of the screen may require compensation to the exposure indicated when a particularly transparent screen is fitted. Details of this are supplied with the screen.

If you have a camera that has a fixed screen, and you are not satisfied with the particular combination of focusing aids available, it is often possible to have the screen permanently changed for a different one. A competent camera repair shop should be able to do this.

Whether or not a focusing screen is easy to use is decided largely by the focusing aids which it incorporates. The simplest type of screen is just a matt surface backed by a fresnel lens, which provides even illumination over the whole area. Most cameras, though, have a split image rangefinder, or microprisms, or a combination of the two.

A split image rangefinder always takes

Viewfinders Action finders (above) allow you to see the image from a distance. Other finders (below, l-r) have other functions: standard pentaprism; eyesight correction finders; swivelling eye and waist level finder; magnifier



the form of a clear circle in the centre of the screen. A line across the diameter of the circle splits out of focus parts of the subject into two, but leaves in-focus parts unbroken. This split image is produced by a pair of tiny prisms, moulded on to the underside of the plastic screen. The slope angle of the prisms is very critical, and must be carefully matched to the focal length and maximum aperture of the lens with which the screen is to be used. If the angle is too steep, one half of the rangefinder circle will go black, making it impossible to focus. If the angle is too shallow, the accuracy of the rangefinder is reduced—rather like having too short a base length on a rangefinder camera (see page 614).

Microprisms are constructed in a very similar way to rangefinder wedges, but they are much smaller, and they can be fitted to any part of the focusing screen, and can even completely cover it. When an out of focus image falls on the microprisms, they shatter it, and break it up into tiny regular patterns. This has the appearance of a shimmering surface. When the image is in focus, it appears unbroken, and the pattern of the microprisms disappears completely.

Standard screens

Standard focusing screens are usually made with a combination of split image rangefinder, microprisms, and plain

mat finish. When the subject has straight lines, or clearly defined contours, a split image rangefinder is ideal, as these are broken up by the central line. Microprisms, on the other hand, make it easy to focus on areas of even tone. For a rangefinder spot to break a subject clearly into two parts, the line on the subject must run at right angles to the direction of the break. Most cameras have a horizontal break, but a few break the subject diagonally. This is sometimes more convenient, particularly when the subject has no clear vertical lines.

Microprisms are usually placed in a ring around the central rangefinder spot, and this, in turn, is surrounded by another concentric ring of plain matt, free of fresnel lens circles which can interfere with focusing. A few of the newer cameras have such a fine fresnel pattern that this plain matt ring is dispensed with, and focusing can be done on any part of the screen.

This standard screen gives accurate, easy focusing under normal conditions and with a standard lens, but most photographers take pictures in a wide variety of different circumstances, often with a range of different focal lengths.

One of the options for cameras that accept interchangeable screens is a screen that has microprisms matched to the focal length of the lens in use. The Nikon F3, for example, has two different

designs of focusing screen of this type, and both of these are available in four versions, suiting wide angle, standard, telephoto and super telephoto lenses. One of the two screens has a central microprism circle and a clear surround, and the other is totally covered by microprisms. The exact choice of screen for use with a particular lens depends not just on the focal length of the lens, but also on maximum aperture. If you use an ultra-fast standard lens such as an $f/1.2$, changing the screen for one fitted with steep angle prisms will result in more accurate focusing, particularly in poor light.

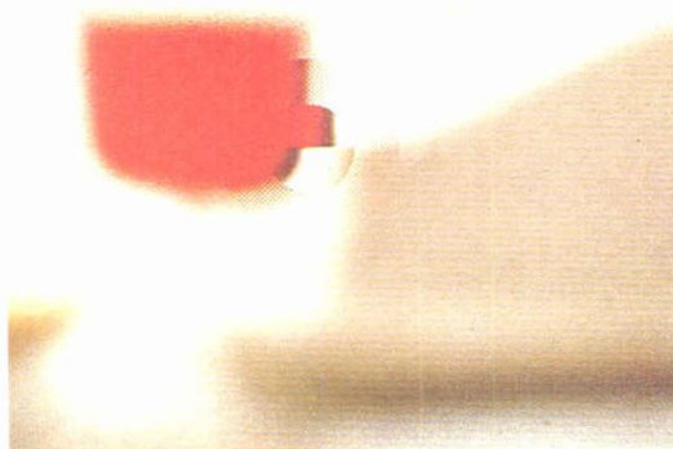
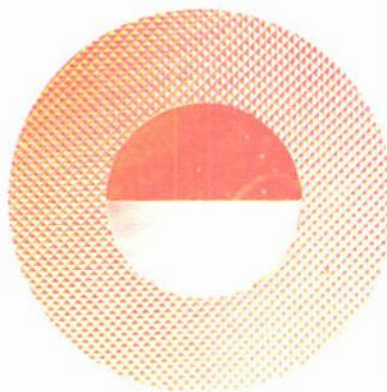
Conversely, if for some reason you are obliged to use a lens that has quite a small maximum aperture, such as a macro or perspective control lens, then a screen incorporating less steep prisms will enable you to use the focusing aids more easily—they do not blackout as they would on a normal screen.

Special screens

Some photographers prefer a screen which has no focusing aids at all, and so most cameras that accept interchangeable screens have one of this type available. Such screens are also useful if you frequently need to check depth of field. Although they darken when the aperture is closed, the image remains visible over the whole area of the screen, instead of

Split image focusing

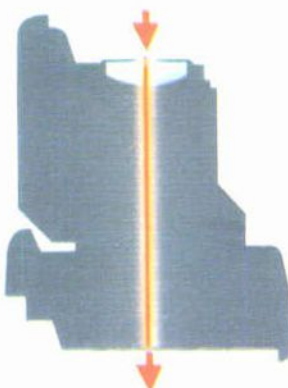
The split image focusing screen is familiar to owners of many modern SLRs. With the standard lens, it works simply and efficiently—when the image is in focus, lines in the image in each half match up and when it is not in focus the image is split. But when a lens with a small maximum aperture is used, or if a faster lens is stopped down, one half goes dark and cannot be focused properly (below right)



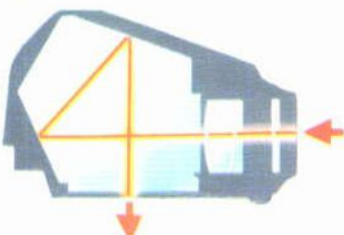
Michael Freeman



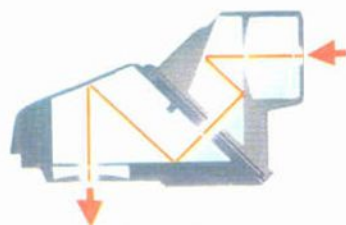
magnifying finder



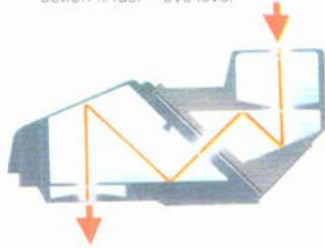
folding hood



conventional prism



action finder - eye level



action finder vertical

Interchangeable finders *Magnifying finders are used in close-up photography and when critical focusing is important; simple waist level viewfinders are valuable for shots in tight situations; dioptre correction lenses can be fitted to compensate for poor eyesight; action finders can be used at any angle from eye level to waist level*

blacking out in parts—as it does on a screen incorporating microprisms or a split image rangefinder.

In addition to these plain screens, there are a large number of special screens designed with very specialized applications in mind. These include *chequerboard screens* which are useful for architectural work, as they allow the photographer to check that horizontal and vertical lines appear that way in the viewfinder. *Graduated screens* have a scale in millimetres engraved on them, and these are useful for measuring magnification in close up work, or measuring size when the camera is attached to a microscope. *TV screens* are marked with the proportions of a television screen and are used when preparing colour slides to be broadcast on television. Other types include screens to be used with endoscopes in medical photography and telescopes for astronomical photographs. All of these screens are obviously of specialized interest, but if you use your camera in connection with your work, you may find that there is a screen available for your camera which is easier to use than the one that is fitted as standard.

Changing viewfinders

A number of 35 mm cameras can be fitted with interchangeable viewfinders, a facility that is almost universal in larger format cameras. A retaining catch on the camera prevents the prism from falling

off accidentally, and when this is released, the standard prism can be slid off or lifted out of position, and replaced by an alternative viewing system.

Beside the basic pentaprism, most manufacturers offer an alternative prism that has an enlarged viewing window, through which the whole focusing screen can be seen, even if the photographer's eye is not pressed firmly against the eyepiece. The distance from the eye to the finder is called the *eye relief*, and on this large scale prism it is usually about 25 mm. Most pentaprisms have an eye relief of 15 mm.

Action finders, as these prisms are called, are ideal for fast moving sports subjects, and situations where it is impossible to get your eye close up to the viewfinder window. Goggles and safety glasses also often prevent this, and when the camera is in an underwater housing it is impossible to use a standard prism. Some action finders are fitted with a swivel joint that allows either a horizontal or vertical line of sight. This allows them to be used at awkward angles and very low levels.

An eye level view of the subject is not always the most convenient one. When the camera is very low down, it is much easier to look directly at the focusing screen, rather than sprawling on the ground to peer into the viewfinder.

Waist level finders make it possible to see the screen clearly through the top of the camera. Naturally, it is possible to do the same thing by simply removing the prism, but a waist level finder has a collapsible hood that keeps stray light off the screen, and is also fitted with a magnifier for critical focusing.

Chequerboard screen *One of the most useful alternative focusing screens has a square grid that helps to ensure that the picture is completely level—this is invaluable for architectural shots*



Angelo Hornak/Vision International

These hoods are good for copying, because when the camera is fixed to a vertical copy stand, a pentaprism viewfinder forces the photographer to clamber up above the camera in order to see the focusing screen. A waist level finder avoids this.

A drawback to this kind of viewfinder is that the image on the focusing screen is reversed left to right, as it is with a large format SLR.

Magnifying finders perform the same function as waist level finders, except that they give a greatly enlarged image of the focusing screen—typically six times bigger. They are most useful for really critical work where correct focus is specially important. Their usefulness for everyday photography is rather limited. Like waist level finders, they produce a reversed image of the focusing screen.

Viewfinder accessories

Many cameras do not have interchangeable finders, but this does not limit them to eye level use alone, as most systems have a *right angle finder* available. This fits on to the viewfinder window, either using a sliding action, or else screwing into place. It converts an eye level pentaprism into a reasonably good vertical type finder—similar to a magnifying finder, but with an image that is not enlarged. Some models give a right-way-round picture, but most right angle finders give a reversed picture of the focusing screen.

Focusing magnifiers can be fitted to the viewfinder in a similar way, and produce an enlarged view of the centre of the focusing screen. Since they do not show the whole screen, they are only useful for critical focusing, and are hinged to flip up out of the way when not in use. Most cameras can also be fitted with a *rubber eye cup* which fits over the viewfinder window. This excludes stray



Michael Freeman

light, and makes it easier to see the focusing screen in very bright sunlight.

Dioptries and eyesight correction

Few photographers, unfortunately, have perfect eyesight. The most common fault is short sight—the inability to see distant objects. Camera manufacturers recognize this handicap, and construct their viewfinders in such a way that the image of the focusing screen appears to be one metre away from the photographer's eye, or closer. If you have normal eyesight, you will have no difficulty in seeing this image, but if you are long sighted, or have very short sight, you may find that you need to wear glasses to see the screen clearly.

This brings problems, because it is not always possible to see the whole of the focusing screen when wearing spectacles. A better alternative is to use an adaptor lens which changes the apparent distance of the viewfinder image, either moving it out to infinity to

Graduated screen *Specialist screens like this are used if a camera is fitted to a microscope, as this stops microprisms and split image wedges from working. The graded lines help you judge the scale of the image*

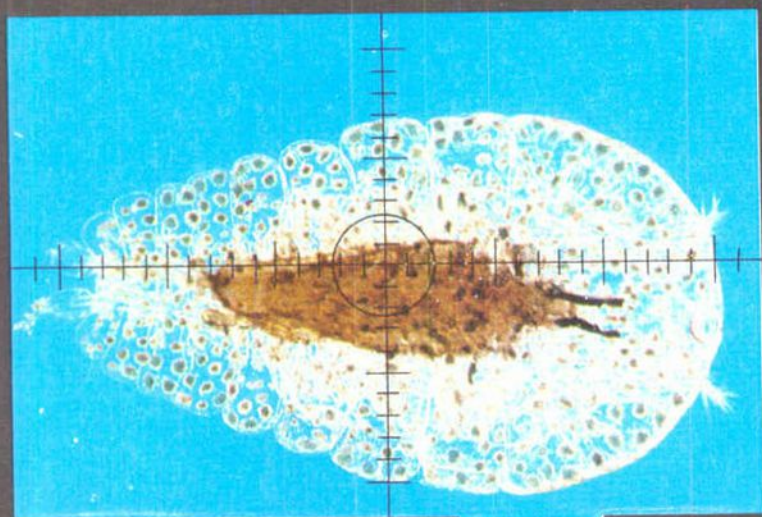
Viewfinder accessories *If your standard viewfinder is not interchangeable you may still be able to attach a flip-up magnifier (left) to your eyepiece, or a right angle viewer so you are not limited to eye-level viewing*

suit long sighted photographers, or bringing it closer in for short sight. The large camera manufacturers make adaptor lenses, calibrated in *dioptries*. The dioptry value is the strength of the correction lens, and can be positive or negative. Short sighted photographers need correction lenses with a negative value, and if you have very short sight, you may need a lens as powerful as -3 dioptries. Correction lenses for long sighted photographers, on the other hand, have a positive value.

Correction lenses are easily fitted to the camera—they either slide over the viewfinder window, or screw into it. If you normally wear spectacles, you may find that buying one of these lenses enables you to see the whole screen more clearly. Since the exact specifications of different camera viewfinders are not the same, it is important to buy such lenses over the counter, so that you can choose the one that best suits your eyesight—it may not have the same strength as your spectacles. If you have astigmatism, or similar eye defects, you may need a specially ground lens, and should see your optician.

The Pentax LX has built in variable dioptry correction, which is adjustable over a 4 dioptry range. This is the ideal solution to eyesight defects, and though it is still rare on modern cameras, it is likely to become more common.

Although the idea of special viewfinders may at first sound rather unnecessary, it is surprising how valuable they can be. Many people, for instance, consistently take out-of-focus pictures, not realizing that their eyesight is at fault. Other photographers may even buy a new camera with a different format simply because they want an eye level viewing system. If you do find problems with any area of your work, it may be worth investigating the possibilities of special viewfinders. And anybody who regularly carries out any form of technical photography may find that a camera with interchangeable finders and viewing screens is a worthwhile investment which makes life much easier.



Peter Parks/Oxford Scientific Films

Improve your technique

Slide copying

Each of your slides is an original and cannot be replaced. If it is damaged or lost the picture is gone forever—unless you make a copy. Once copied, the original can be kept permanently, out of harm's way



Copying quality Even in a good copy, there is inevitably a slight, but acceptable loss of colour, highlight detail and definition from the original (left) but in a copy made from a copy (above), loss of quality can be severe

John de Visser

There are many reasons why copies or duplicates of original transparencies are needed. Unlike negatives, which are only an intermediate stage between the taking of a photograph and the final print, a transparency is a one-of-a-kind original. Lose it, and you lose the only record you have of the original scene. A duplicate of the original, however, can be used regularly without fear, as the original is stored away safely.

As well as making straightforward facsimiles or true copies of an original, you can also make modifications during the duplicating process, to correct for slight faults such as colour casts or underexposure. And by copying more than one original on to the same piece of film, you can create new images altogether. Such images can be made in the camera on location (see pages 513 to 517), but when using a duplicator you can experiment, and can call upon your entire library of images. There is inevitably a slight loss in quality compared with in-camera effects, but the advantages are considerable.

The additional equipment you may need for making your own duplicates can range from none at all, if you have your own slide projector, through an inexpensive slide copier, to a professional quality bench copier which will cost

considerably more than the average SLR camera. The quality obtainable increases with the amount of equipment, but for comparatively little outlay it is possible to get very satisfactory results.

Using a projector

Since most photographers who use slide film own a projector, this method of copying original slides is very economical. It involves simply projecting the slide, and photographing the projected image.

When setting up your equipment for copying by projection, it is very important to realize that the surface on to which the original is being projected affects the quality of the copy more than any other factor. The copying camera must be mounted on a tripod as close as possible to the axis of the projector lens, and should be aligned so that it is pointing directly at the screen surface. The screen should be as plain and flat as possible.

Since nearly all modern projectors are equipped with tungsten halogen light sources with a colour temperature of about 3200 K, tungsten balanced film is usually best for duplicates. If possible, avoid using daylight film with a conversion filter (normally the blue 80A) as this would add nearly two f-stops to the

exposure which will aggravate the problems of focus and camera shake.

For the best quality use the minimum practicable projected enlargement, which will therefore give the brightest possible image.

The exposure can be determined by either using the camera's through the lens exposure meter in the normal way, or by selecting an appropriate area in the projected enlargement and measur-

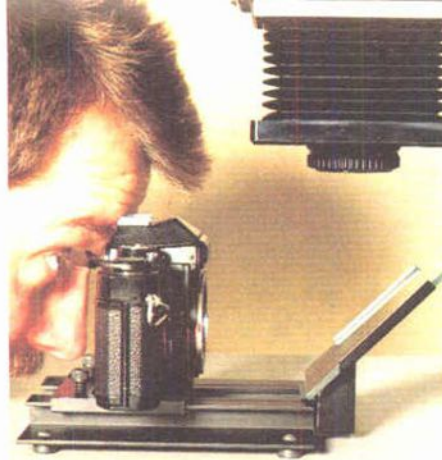


Bench top copier Sophisticated bench top units like this ensure good quality copies but are very expensive

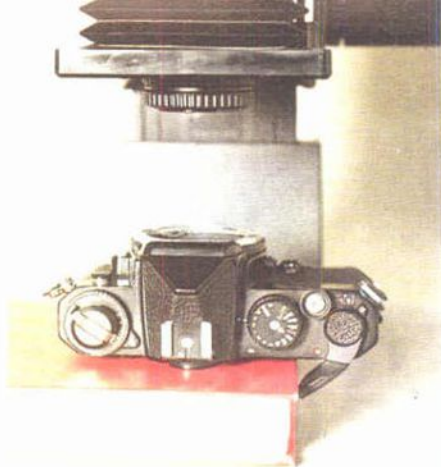
Ed Baxter/ Copier courtesy of Elinchron



Projection copies Removing the lens from a projector allows you to photograph the slide directly, using the projector itself as a light source



Using a mirror If you remove the lens from your camera, you can make good copies in the darkroom, using an enlarger and a front silvered mirror



Minimum equipment All you need for a rough and ready duplicate is your camera and enlarger, but this set-up needs very careful alignment

ing the reflected light with a hand-held light meter.

When estimating the exposure and taking the copy photograph, turn out all other lights in the room. It may also be a good idea to temporarily shield the light spilling from the lamp housing of the projector. But do not leave the shielding in place or the projector may overheat.

Framing the image in the viewfinder and focusing should be done very carefully. Remember that because most viewfinders show only the central 90 per cent of the actual image area, there is no need to allow for a border round the copy. Frame the projected image as tightly as possible. When you see the results you may even find that you can move in even closer.

The projection method can produce duplicates of fair quality. Its limitations are the fact that the image is being passed through both the projector lens and the camera lens; the quality of the screen; and the evenness of illumination of the projector, which may produce a 'hot spot' in the centre of the image.

If you have a set of extension tubes, you can avoid these problems by photographing the slide in the gate of the projector using the following technique.

Take the lens off the projector, and fit

extension tubes to your camera. Use a telephoto lens if possible, since this allows a greater separation between lens and slide. Place the projector on a table, and set up the camera on a tripod, so that it looks into the aperture where the lens is normally fitted. Through the viewfinder of the camera, you will see a brilliantly illuminated image of the slide in the projector gate when you switch on the projector light.

In some slide projectors, the slide is deeply recessed within the body of the projector, and you may find it difficult to get the camera lens close enough to the slide. If you do have problems, try using a longer focal length lens, or even inserting the camera lens into the front of the projector.

Careful alignment of camera and projector is essential, and once it is correct, take great care not to disturb either camera or projector. If you have a motor winder, use this to avoid shaking the camera when you wind on, and always use a cable release on the camera. If your projector has a remote control use this to avoid moving the projector each time a slide is changed.

This way of copying slides is rather awkward to arrange, but once the position of camera and projector have been established, the process of copying

is very fast. Using a motor winder, it need only take a minute or two to copy 36 slides.

Copies from your enlarger

If you own an enlarger, then you already have everything you need to produce high quality duplicate transparencies. The lens on an enlarger is ideal for use at short distances, and can give better copies than your camera lens. The light source in an enlarger also provides an even and consistent source of illumination for the transparency.

The simplest technique with an enlarger is to place the camera on the baseboard, and project the image of the slide into the camera body, without the camera lens. Unfortunately, it is difficult to view the image properly without a right angle viewfinder, and so some manufacturers make a front silvered mirror on a rigid bracket. This turns the path of the light from the enlarger through a right angle, and the camera can be used in a more normal position. The filter drawer of the enlarger can be used for colour correction, or a colour head can provide dial-in colour changes.

If the head on your enlarger turns to allow projection on to the wall, you may be able to fit your camera onto a tripod, and project the slide on to the film. This eliminates the need for any accessories.

Using a slide copier

There are a number of slide copiers on the market. The simplest consists of a close up lens in a barrel, with a holder for the transparency at one end. It is used in place of the camera lens, so it is completely self-contained.

The lens included in such devices may have a very small aperture—typically $f/32$ —in order to give sharp images with good depth of field without using very costly optics. This means that the image may be so dim that a very bright light source is needed. One saving grace is that because the copier is firmly fixed to the camera, vibration is not much of a problem and time exposures are possible without much trouble.

Some versions have a zoom lens, enabling you to make selective enlarge-



Bellows copier Selectively cropped copies can be made using a copier attachment fitted to a bellows unit



Simple copier Inexpensive copiers are capable of giving quite reasonable results and are easy to use



Copying procedure The first stage is to insert the slide into the copier—it fits behind a translucent plastic sheet which diffuses the illumination

ments when copying.

Another device is intended to be used with a bellows extension (see page 407) and the camera's own standard lens. The copier may have its own bellows, to allow for changing the scale of the image. The lens may be used with a reversing ring (see page 406) to improve quality, and magnifications from 1× to 10× are possible. This camera-bellows-slide copier arrangement must be set up on a sturdy tripod, or preferably clamped to a bench, to eliminate camera shake. A cable release is essential.

Illumination

Whichever system you are using, there is a choice of light source. Daylight can be used, but it is not ideal because of its inconsistency in intensity and colour, unless you only need a quick, cheap reference duplicate.

For simplicity of operation, consistency and relatively low cost, tungsten is the light source that is usually preferred. The standard procedure is to place a tungsten photoflood 1 m or so directly behind the original in the slide holder. The light should not be any closer, or the slide may be damaged by the heat. If a tungsten photoflood is used with artificial light film, an 81A correction filter will be needed in order to correct for the slight difference in colour balance between light and film. It is best to use a gelatin filter placed between the light source and the transparency holder. In many cases, though, the small difference in colour balance can be ignored.

The exposure is easy to measure using the camera's TTL metering system (remembering that the 'stop-down' method has to be used once the lens is closed down since most units do not allow automatic stop-down metering).

Exposure For good results, you must shoot a test roll. Place a small flash gun at a range of distances from the copier and pick the best exposure



Focusing A bright light source is needed, as simple copiers have a small aperture lens and the image in the viewfinder of the camera is very dim

With non-TTL metered cameras tests have to be made based on hand-held meter readings made by measuring the light transmitted through the transparency in its holder.

One other major advantage of using a tungsten light source in this way is the availability of low contrast duplicating film, balanced for tungsten illumination (3200 K). The main drawback with this film is that it is only available in 30 m lengths and is, therefore, only really useful when you need a great deal of high quality work.

The most convenient light source, however, is electronic flash. This provides constant and readily available illumination and helps you to achieve consistent results. And if your copier has no iris diaphragm, you can vary the exposure simply by moving the flashgun, which must be on manual operation. Doubling the distance between gun and duplicator, for instance, reduces the effective exposure by 75 per cent. Calculations, though, are complex, and the best way to find the correct exposure is to make a series of test exposures with the flashgun 17, 25, 35, 50, 70, 100 and 141 cm from the copier. The distance that gives the correct exposure can be used for all similar slides.

The main advantage of using small

flash units is that daylight film can be used and, unlike a tungsten light source, it does not cause heat problems. The need to have sufficient illumination to focus and set up is the main snag.

Bench top copiers

The third alternative procedure—a bench top copier—for producing duplicate transparencies is the most expensive. In many cases these copiers require a lens other than a normal camera lens for best results but, once the technical operations are mastered, they are able to provide the highest quality duplicates consistently and easily. They usually have the added advantage of using daylight film.

The facilities offered by bench top copiers vary. Some have built-in colour correction filters, while others merely have filter trays. Nearly all such copiers have a method of reducing contrast by giving an overall low-intensity fogging exposure across the entire frame.

As with the simpler systems described earlier, and no matter which individual bench-copier is chosen, tests have still to be made to determine the relationship between the lens, the light source, the film type and batch, the exposure necessary at differing degrees of enlargement and the amount of contrast control needed. All these tests have to be carried out with a 'standard' transparency before the unit can be used.

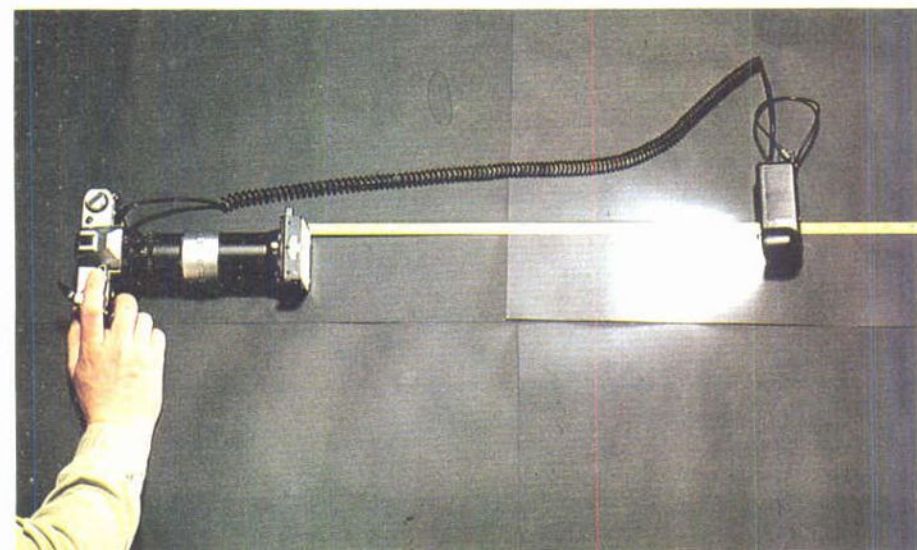
Once this transparency has been 'programmed', high quality duplicates of similar slides can be produced.

General copying principles

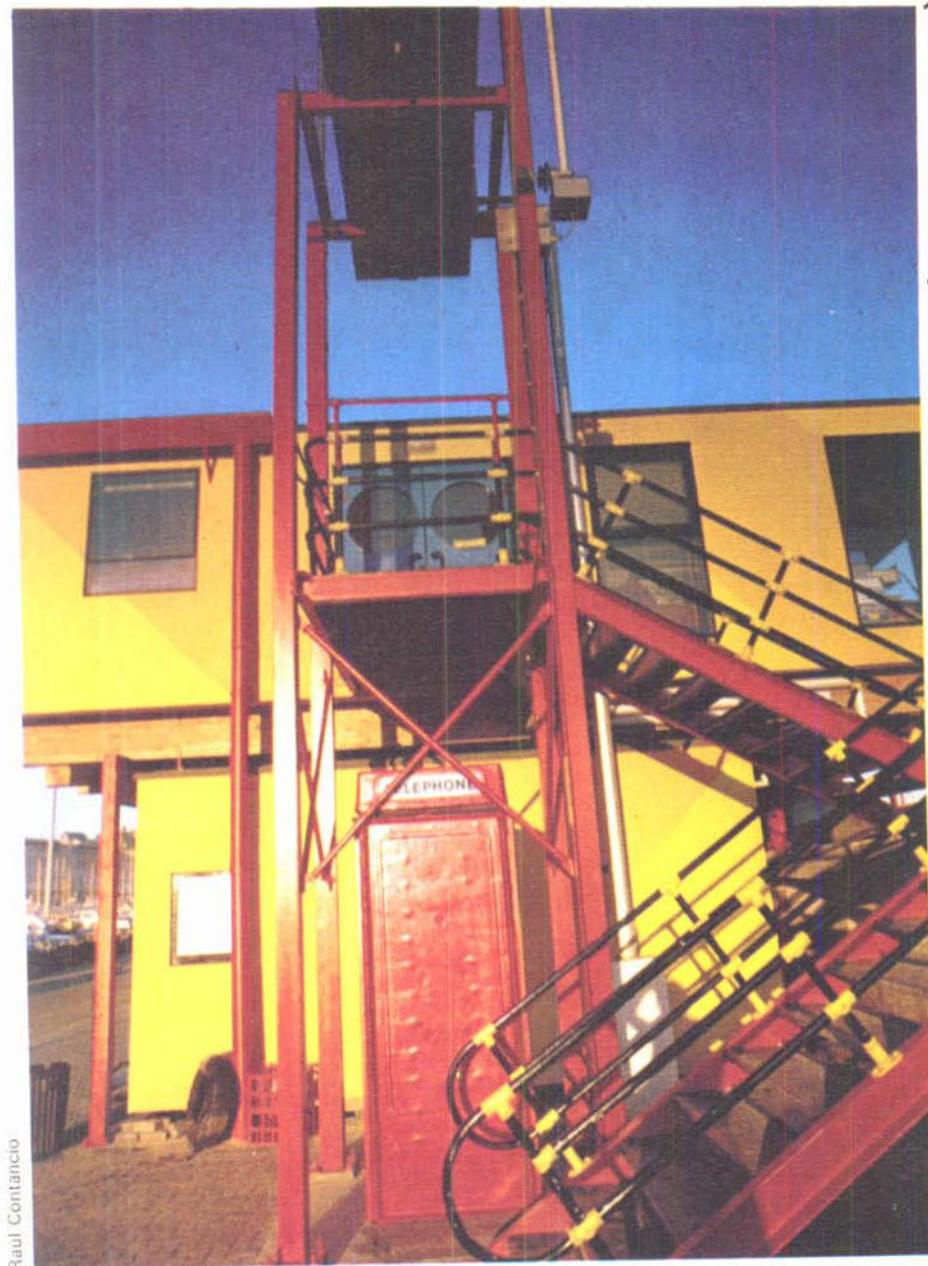
In practice, for facsimile reproduction of transparencies there are a number of factors which should always be borne in mind, no matter which procedure is being used.

Make sure that the originals are clean and dust free—scratches or drying marks will always appear far worse on the duplicate. The best way of cleaning a slide is to use an aerosol-type cleaner, which allows you to direct a jet of gas into the corners of the mount where dust tends to lurk.

Details that have been lost through overexposure in the original cannot be recovered. It is possible to make substantial improvements with off-colour or



Jon Bouchier/Zoom copier courtesy of Sunagor



Raul Contancio

140 cm

100 cm

70 cm

50 cm

35 cm

underexposed transparencies, but not with slides that are too thin and pale.

Colour cannot be changed selectively, but colour casts can be removed or added. Always check the original visually with and without the correction filter to see whether the filter gives the correct colour balance.

Take extra trouble with slides which have soft pastel hues or a generally monochromatic appearance. They require care in order to achieve good quality duplicates, particularly in terms of contrast and colour control.

Contrast control

All reversal transparency materials have a much higher contrast than general purpose negative materials. If a transparency is copied, the density range of the original will usually exceed the exposure range of the duplicate (see page 131).

There are two basic ways of controlling contrast. The simplest is fogging,

Test Roll After processing, work out how far apart the flash and copier were for the best exposure, and use this separation whenever film of the same speed is in the camera. Here the best distance was found to be 100 cm

in which the film is exposed to low intensity white light in order to decrease the effective exposure range of the original. The other more complex but more flexible method involves the use of masking techniques. For instance, when copying a transparency, a weak black and white negative is bound up in register with the original. This has the effect of adding density to the highlights progressively—the brighter the highlights in the original the denser the corresponding negative areas in the mask—and therefore the effective contrast range of the transparency being duplicated is shortened. This technique called *highlight masking* is fully explained in a subsequent article.

25 cm

17 cm



Raul Contancio

Small camera, big city

New York is visually one of the most exciting cities in the world. It offers the photographer unlimited material—even if only a 110 camera is used



All cities have a great deal to offer the photographer but few people feel like carrying around a full sized and heavy camera system to make the most of the creative opportunities. A compact camera may at first appear to be a solution to the problem but because their lenses cannot be changed, they may be inadequate for the job. To exploit all the possibilities that a city has to offer, you must be able to choose the right lens for the subject—a wide angle to take in the vast expanses of concrete and glass or a telephoto lens for candid shots of the city dwellers, or small details of their environment.

During a recent visit to New York, Sergio Dorantes, who usually carries an extensive Nikon system with him, decided to experiment by using only a miniature SLR system—the Pentax auto 110 complete with winder, 18 mm, 24 mm, and 50 mm lenses. These have equivalent focal lengths of 35, 50 and 100 mm in 35 mm format photography.

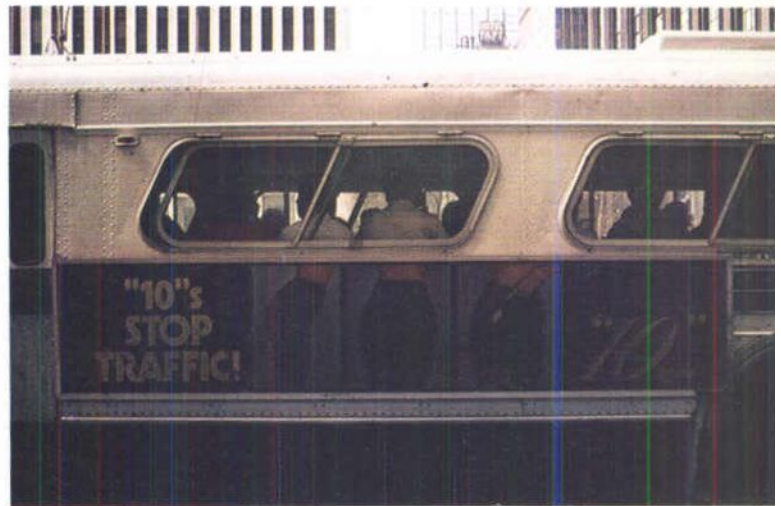
The Kodachrome transparencies Sergio took in New York show that clear, sharp images can be produced on

Airplane's wing Sergio's first shot with the Pentax was of the exciting view through an airplane window. The jet engine was included to strengthen the composition **Big Apple** Sergio used the telephoto lens to photograph the symbol of New York against the bright yellow background of a taxi **Relaxation** The long lens was also useful for this candid shot of a group of New Yorkers relaxing

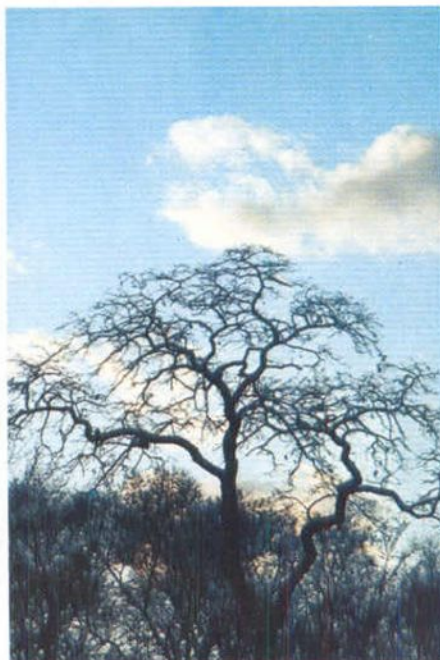


Photographs by Sergio Dorantes





Street trader On the streets of New York there is plenty of activity to interest the photographer. The longer lens allowed the shot to be framed so that the two areas of interest are balanced—the salesman together with his merchandise **Bus** The telephoto was also used for this humorous combination of the passengers and the advertisement



Tree The time of day makes a great difference to the appearance of the photograph. In the low evening light the meter was sensitive enough to give a correct reading. **Man reading** The quiet, tiny Pentax was rarely noticed by Sergio's candid subjects

Assignment

this attractive small format camera.

Sergio found that the interchangeable lens facility was a great asset and the clear screen made it very easy to focus with each of the three lenses. The fact that he could change lenses to get the most suitable focal length helped Sergio to fill the frame—something he considers essential with the 110 format if enlargements are to be of satisfactory quality. The telephoto lens seemed to find the most use and Sergio always fitted it when he saw a subject that would benefit from being isolated from its surroundings. He also found that the winder was a very useful accessory because it added extra size and weight and helped to eliminate camera shake at slower shutter speeds.

During Sergio's trip the exposure meter performed accurately under most situations. One feature he made work to his advantage was the tripod socket. The city takes on a completely different appearance as darkness falls and on the occasion when the subject and lighting demanded the use of either flash or a tripod, Sergio chose to use his tripod. The light meter is fully programmed and it worked surprisingly well when taking pictures in very low light when the exposure values were beyond the meter's range.

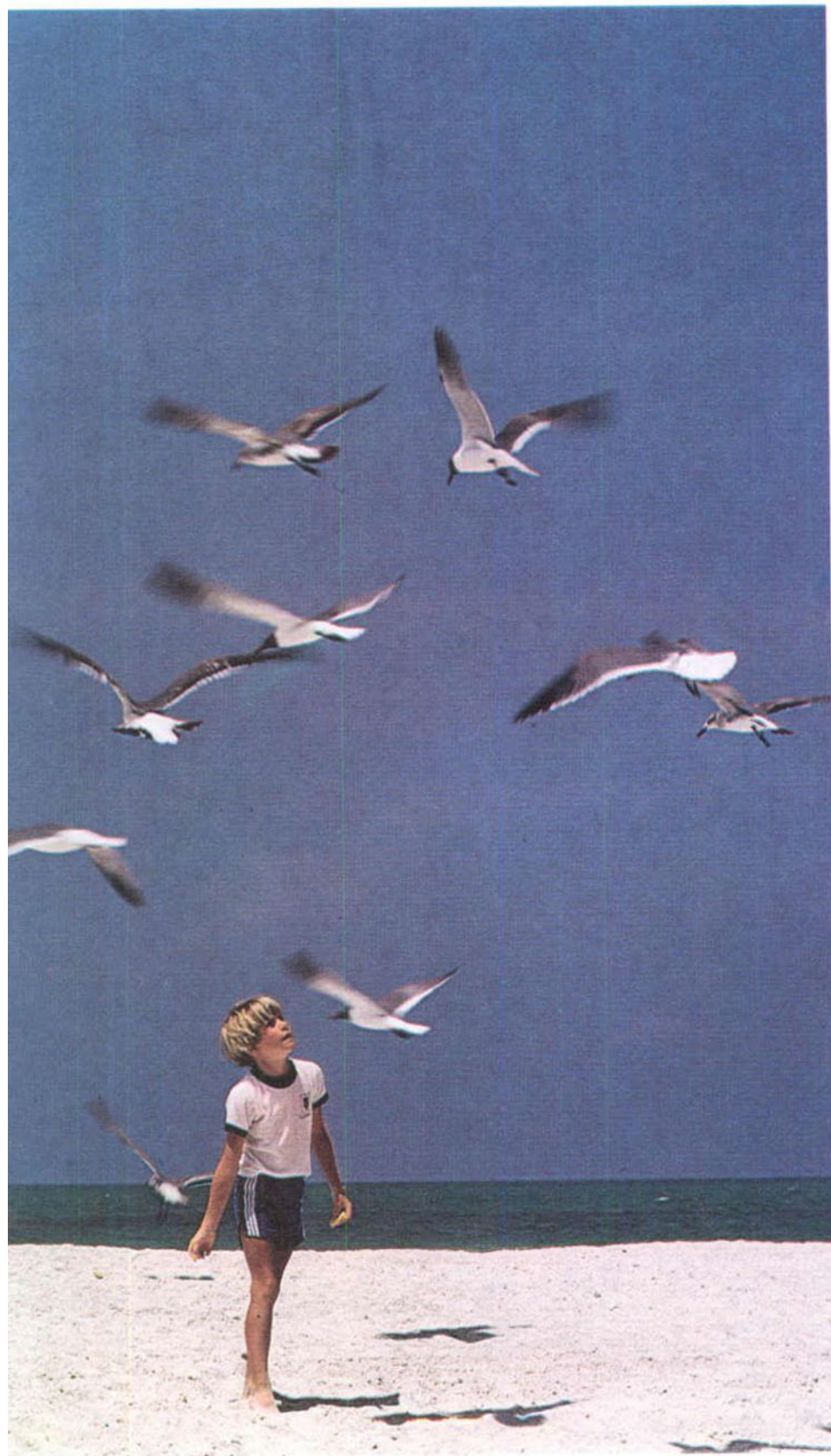
Reflection *The surfaces of a glass building can provide striking subjects, combining the building and its surroundings in a single image.*

Telephone *Sergio looked for subjects which had a particularly American feel—like the wide angle view of a Market Stall which gives equal emphasis to the commodities and the customers*



On the beach

Summer holidays usually offer plenty of new subject material, but do not dismiss those sunny beaches as obvious photographic clichés



All too often, photographs taken on a beach end up as a disappointment—large, empty stretches of plain sand and few areas of interest to break up the monotony. The beach itself rarely works as a subject on its own—but it is certainly an ideal general background, and the photographer must look for additional subjects to add interest.

Photography on a sunny beach, however, also involves more practical problems—extremely high light levels, loose sand blowing around and the hazard of being close to salt water. Professional photographer John Garrett decided that his ideal holiday camera would be a Nikonos IV-A—a rugged all weather viewfinder camera with aperture priority automatic exposure control. It also has the unusual capacity of being at home underwater or covered with sand.

John decided that it would be more interesting to concentrate on people enjoying themselves in and around the water—children, sunbathers, candid. And, with the Nikonos, he had the added advantage of being able to take photographs underwater. Using the marine capability of the camera, John tried photographing one of his sons in the swimming pool, but for a more unusual image he held the camera so the lens was only half in the water. He also found that the camera was very useful for taking pictures of people splashing about in the waves.

Since the refraction of water makes images appear larger, the Nikonos camera is usually fitted with one of the wide angle lenses that are available. Even though an 80 mm lens is made for the Nikonos, John was happy to be able to use his conventional SLR with a telephoto lens for candid shots and other close-up work. Since the slowest timed speed of the Nikonos is 1/30 second, John also found that he needed an ordinary camera for low light work—such as the shot of the yacht framed through the palm trees.

To cope with the bright light levels, John used slow transparency film. The only problem with this is that it has limits when it comes to dealing with wide ranges of contrast. For this reason John tried to avoid shots including both extremes of brightness, such as sand, and extremes of shade, such as that under a parasol. Most of his subjects were fairly evenly lit and in this way he was able to make the most of the bright colours which slow films offer.

Gulls John chose a small aperture, so the camera selected a slow shutter speed to emphasize the birds' movement

John Garrett



Relaxing in the sun
John looked for contrasting colours that would add interest to his shots - here, splashes of gold, yellow and blue

In the sea Making the camera choose a fast speed by using a wide aperture, John found the Nikonos came into its own in the surf. The fast shutter speed caught the child and the water in mid air to make a good action shot

In the pool The Nikonos can also be partially submerged to provide an unusual image

Eye shades John found a conventional camera and a telephoto lens more useful for candid shots



John Garrett





Improve your technique

Ultra wide angles

Ultra-wide angle lenses allow you to include more of the subject than virtually any other lens—but unless handled carefully they can give bizarre, unwanted effects

Ultra-wide angle lenses produce pictures which look different from those taken with standard, telephoto or moderate wide angle lenses. The images from such lenses, with focal lengths between 13 and 21 mm, are instantly recognizable from the outward sweep of detail near the corners.

On looking closer, however, one notices that the centres of the pictures are virtually the same as those produced by less extreme focal lengths, with little distortion of straight lines. In contrast, still shorter focal length lenses, which come into the fish-eye category, have fields of view wider than 120°, and suffer from barrel distortion (see page 338) so that straight lines appear curved.

Ultra-wides have a variety of uses. They are valuable in confined spaces, or for including more of the surroundings than a more conventional wide angle lens. For such purposes they are simply a more extreme version of a straight-forward wide angle. But the edges of the field of view do tend to show more extreme distortions than those of, say, a 24 mm lens. These distortions are sometimes useful for creating a bizarre effect, but usually they are undesirable and the photographer must take a number of precautions to avoid them.

In this case, if a less extreme wide angle lens is not available, keep your

main subject within the central area of the frame so that a normal enprint or masked-down slide mount will cut off the extremes of the picture. The very wide angle of view covered means you must hold the camera precisely parallel to any subject you want to record accurately. If there is any tilt on the camera, parallel lines in the subject immediately appear to converge or diverge. This is a result of the greater perspective effect caused by having to move closer to the subject.

If you want to use an ultra-wide for accurate architectural shots, it is a good idea to have a spirit level on the camera's flash-shoe. To avoid converging vertical lines, align the camera parallel to the ground with the spirit level, then check by comparing verticals in the picture with the upright ends of the viewfinder frame, unless this has a slightly curved appearance. On a tripod, adjust the camera as accurately as possible by this method and check by panning so that a vertical wall end or pillar lines up, first with one end of the frame then the other. When it matches both frame ends exactly, your camera is perfectly aligned for architectural shots.

Once positioned in this way, the camera height may have to be adjusted by racking the tripod up or down, or by choosing a different viewpoint, in order to get the whole building in the frame. This may



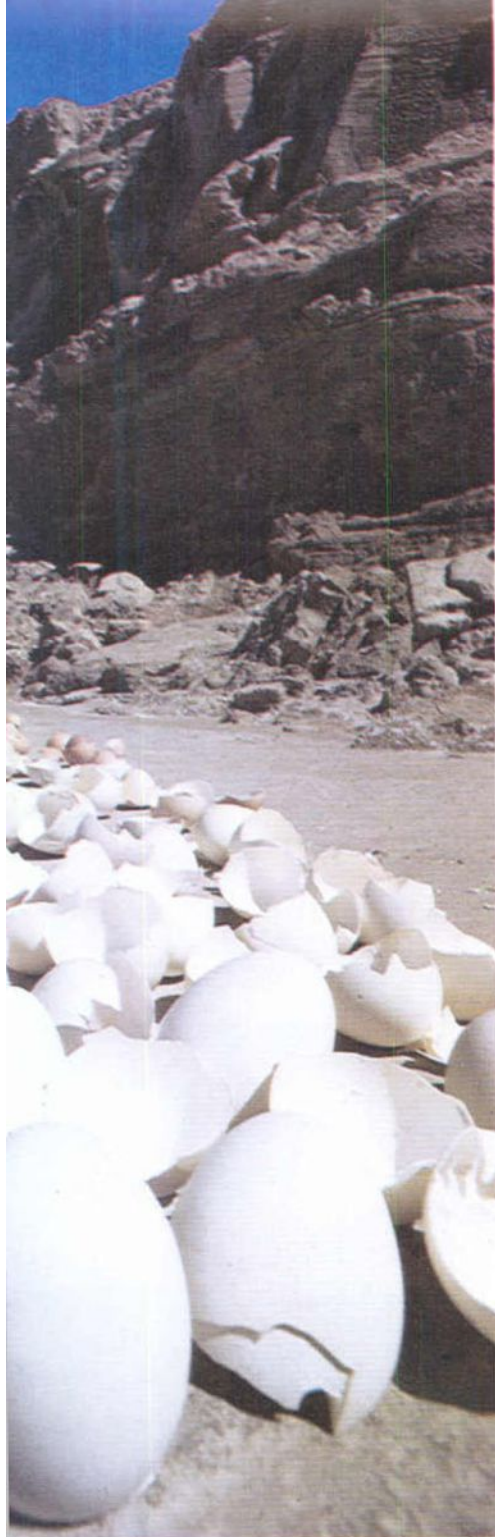
also result in the desired composition occupying only part of the frame. If you enlarge your own pictures, this is not a problem as you can just use that part of the negative containing the building. In this way an ultra-wide can be used quite effectively in place of a perspective control lens (see page 778).

For colour slides, however, it may be inconvenient to use this method. In this case the secret is to look for a suitable



Cycling shot With a long exposure shot of a moving cyclist taken from a car, the 'edge rush' effect of an ultra-wide gives a tremendous impression of speed—but this kind of shot needs a straight, empty road and extreme caution

Dave Robinson



Robin Bath

Seaside shells *An ultra-wide lens has enormous depth of field, and if it is stopped down, everything from a few centimetres to infinity is in focus*

only the corner of the frame. By employing as little as one quarter of the negative or slide, and enlarging or slide copying later on, you will produce a shot which is distorted on one side, and which looks unbalanced and often grotesque.

You should not be afraid to use an ultra-wide in situations where longer lenses are more usual. For example, an ultra-wide is capable of taking a head-and-shoulders self portrait from arm's length. Held above your head, you can photograph yourself full-length. Try high or low viewpoints even if they are no more than a metre higher or lower. This sort of approach will often produce unusual distortions, but these can be used creatively. Furthermore, a camera with an ultra-wide lens can often be inserted into a gap or hole, such as in a fence, and reveal far more than you could see by eye alone.

The use of unusual viewpoints needs a lot of care and thought. A common fault in ultra-wide technique is the use of too low a viewpoint, so that a small part of the nearby ground takes on far too much significance. Dirty carpets, patchy concrete floors and so on, which might not show with a normal lens, suddenly become very prominent. When possible, avoid too much foreground, perhaps by choosing a higher viewpoint.

Ultra-wides are unique in the way they reproduce the various planes of the subject. They create impact by showing these planes from different angles, from a viewpoint between them. For example, only the use of a wide angle allows you to increase the amount of sky you include, as you cannot change it by moving closer!

One of the most dramatic features of the ultra-wide lens is its effect on parallel lines. The normal convergence of such lines to a vanishing point is exaggerated by the extremely wide field of view.

This effect is not unique to ultra-wides, but is more noticeable when using them. It is important when taking pictures with converging verticals to balance the angle at which the subject apparently leans. The amount of convergence must balance on each side of the subject, so that the whole picture does not appear to be about to fall over sideways. This does not always mean ensuring that a line running through the centre of the frame is perfectly vertical or horizontal. It means looking carefully through the finder, and deciding when the overall feel of the picture seems balanced. You can usually tell mistakes straight away. Often the horizon is tilted, or the subject seems about to drop out of the frame altogether.

Changing scale

For dramatic images, use the steep perspective of the ultra-wide to juxtapose small, nearby foreground details, such as a face, against wide background vistas. There will be a great scale difference between the close subject and the general view, because of their widely different distances from the lens. By concealing middle distance detail, such as empty ground, the foreground subject, a picture is produced which is all foreground and background with little visual connection. This is useful for making visual points or messages in a picture, or for introducing humour.

Because of its special features, the ultra-wide is often used for trick pictures. A small subject, placed very close to the camera, will have its scale changed or made unrecognizable. Try this effect with accurate scale models, model railways and similar subjects. You may have to crop the edges off the picture to get rid of unwanted details and distortions.

With ultra-wides, an object will often appear larger at the edge of the frame than it would at the centre, due to the lens design. This difference of image scale creates strange effects when you pan the camera during a long exposure. The blurred effect looks stronger at the

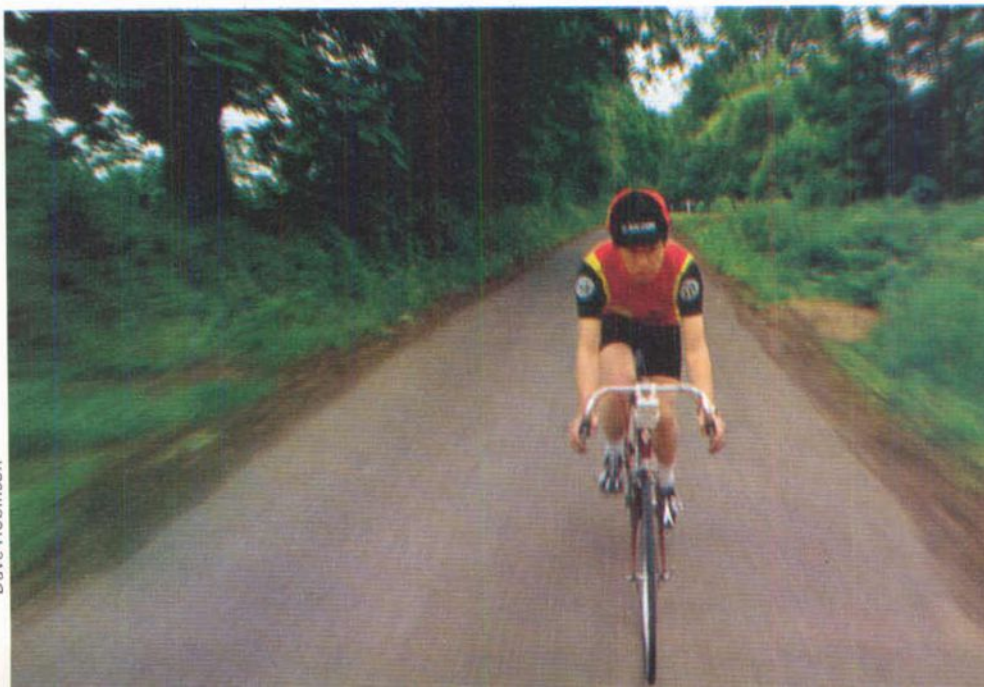
foreground area which completes the full frame of the picture, instead of cropping the unwanted parts of the image away. Then you have a full frame with a balanced composition and perfect verticals, although the main subject may only occupy part of it.

Coping with distortion

Many photographers use the edge distortion of ultra-wide angle lenses to create unusual effects. To gain a vivid impression of this distortion, try positioning identical objects in a row or pattern across the whole frame—circular dinner plates work very well. The change in shape will be very noticeable.

For very dramatic shape changes, use

Dave Robinson





edges than in the middle. If you shoot from a moving vehicle, you get the same effect, with the 'addition of nearby ground detail that appears to rush by much faster than distant detail.

These 'edge-rush' effects, the increase of blurring towards the limits of the frame, convey a strong impression of speed, whether across the frame or forwards into the picture. Keep part of the centre sharp for the greatest effect. You will need to experiment to find the best way of doing this.

Ultra-wides have an enormous depth of field. But this can be a problem when you do not want it. You should not hesitate to work at full aperture if you need to pick out a close object against an out of focus background. You may need to focus slightly closer than the subject to keep the background blurred. However, using the scale difference produced by moving in close can often create a better effect than shallow depth of field and increases the impact of the subject.

The great depth of field of ultra-wides can also be a problem when focusing. It is not always obvious when a subject is not sharply in focus, especially in low light conditions. When using a medium or small aperture, this is rarely a problem as the depth of field will make up for slight mistakes. But if full aperture is used, poor focusing may become apparent when the picture is enlarged or projected. Split image focusing screens are very useful aids and help to ensure that every shot is perfectly sharp.

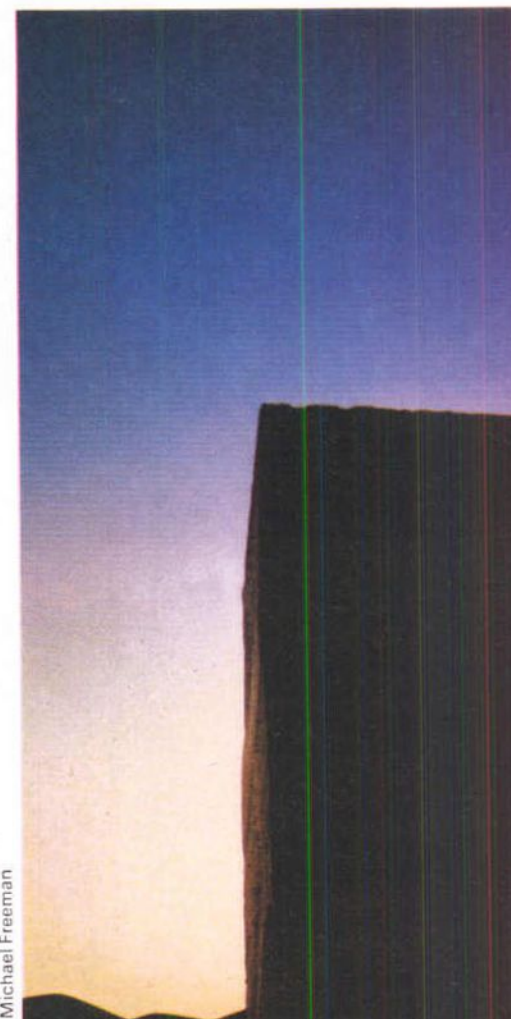
One possible drawback with ultra-

wides is that they have complex groups of elements which, because of their design, cannot be totally free from flare and ghosted patches of light. Lens hoods are rarely effective as they have to be very short to prevent cut off at the edges of the frame. By aiming towards the sun, you may throw off a whole string of hexagonal coloured flare patches across the frame. Put these to good use when you cannot avoid them, by making them part of the picture.

Another feature of the ultra-wide is that the far edges of the frame may only receive one quarter of the exposure of the central area—the effect known as vignetting. As the lens is stopped down, this 'fault' is reduced. But pictures often gain from controlled gradual darkening towards the edges. Try working at full aperture, or only a single *f*/stop down, and use the fall-off to contain the frame visually.

With flash, very few guns, even when fitted with wide angle attachments, will cover the field of view of a lens less than 21 mm. This also results in fall-off, with only the centre of the image properly lit. If even lighting is needed, you can use two flashguns, each aimed at half of the subject—two flashguns can be connected to the camera flash socket using a Y-shaped adaptor, readily available from most dealers. Another way of achieving overall even illumination is to use bounce flash (see pages 354 to 349).

Most ultra-wides will focus as close as about 15 cm with no trouble, but extremely strong visual effects can be obtained by fitting a close-up lens. Extension tubes



are invariably too long and may cause the lens to focus on a point inside its own front elements. Split field close-up lenses do not work well with ultra-wides as the division between the lenses clearly shows as a line across the picture, due to the great depth of field.

In the same way, graduated filters with a hard division between the tones are not suitable for ultra-wides. Those with a soft edge to the colour are better, and the amount of sky included in an ultra-wide shot is ideal for this kind of effect. Because the division between the coloured and clear halves will be crisp even when using a soft-edged filter, the sliding type of filter holder is better than the rim mounted type, as it lets you adjust the position of the division, to hide it or make use of it.

Sun and clouds Flare can be a problem with cheap ultra-wides, but if you cannot prevent it, use it creatively

House and fence With an ultra-wide lens, move in close to the subject for dramatic perspective effects

Towering brick A mundane object given a touch of drama with an ultra-wide and double exposure. The brick was shot first with an ultra-wide and the moon added during a second exposure using a much longer lens

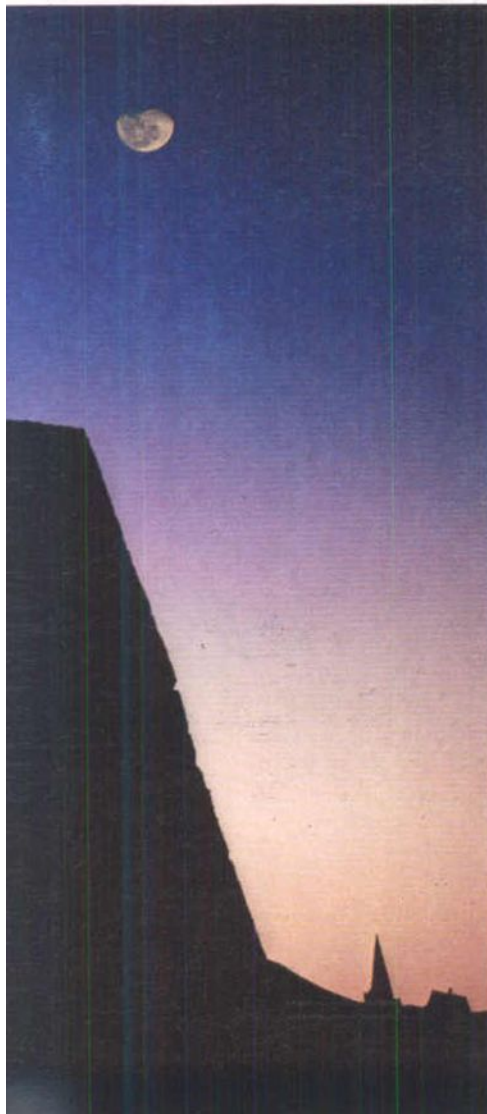
Special effects filters and prisms do not work well with ultra-wides. Starburst and cross screen filters, diffraction gratings and prisms all give effects linked directly to the focal length of the lens used. With an ultra-wide you must use a much stronger star or cross screen to get a good light burst effect. Prisms meant for 50 to 35 mm lenses may fail to work altogether with ultra-wides, as well as cutting off the edges of the picture and, unfortunately, there are no special effects prisms for ultra-wide work.

Interesting cloud shots can be taken by day or night with an ultra-wide because of the extra sky area it covers. At dusk, put the horizon at the bottom of the frame and use a long exposure so that moving clouds record as a sweeping pattern.

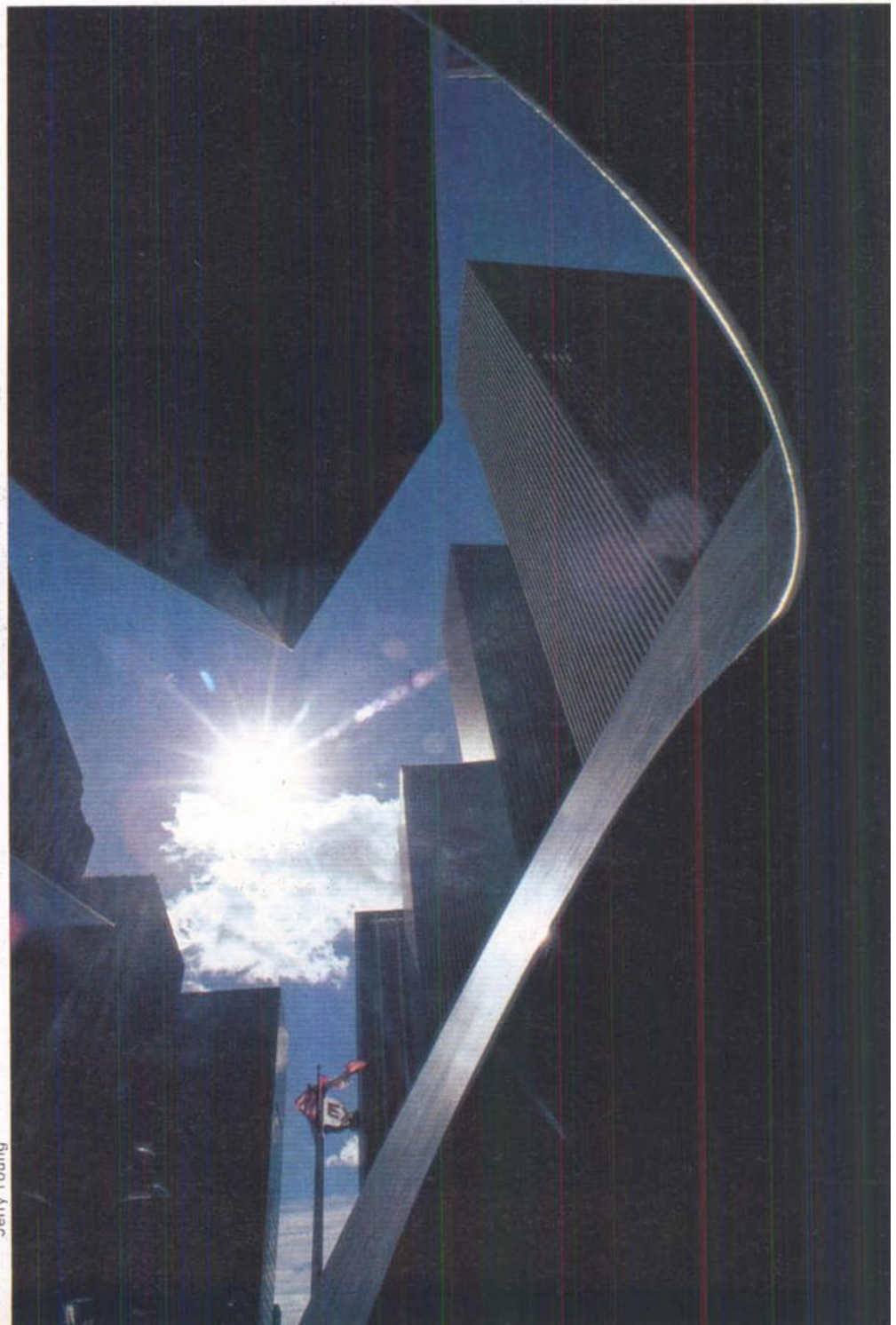
Indoors, use the ultra-wide for photo-

graphing small items, but be careful with large subjects because simple backgrounds are difficult to arrange—most backgrounds that are suitable for normal lenses, such as rolls of paper, will not be large enough to cover the full frame. If you are using paper as the background, one way to fill the whole frame is to set the roll on end in the form of a deep curved bay, suitably supported.

The combination of unusual image geometry and critical handling make ultra-wides difficult to master. Often it is better to start with a less extreme wide angle and learn the technique in stages. An ultra-wide will offer you new possibilities. You will have to get closer, and rethink your approach to the subject. But, for all this effort, you may be rewarded with an unusual photograph.



Jerry Young





Darkroom

Mounting prints

Some photos deserve more than being left in an album. With a few simple techniques and materials, though, you can mount your prints for permanent display



David Cripps/EWA

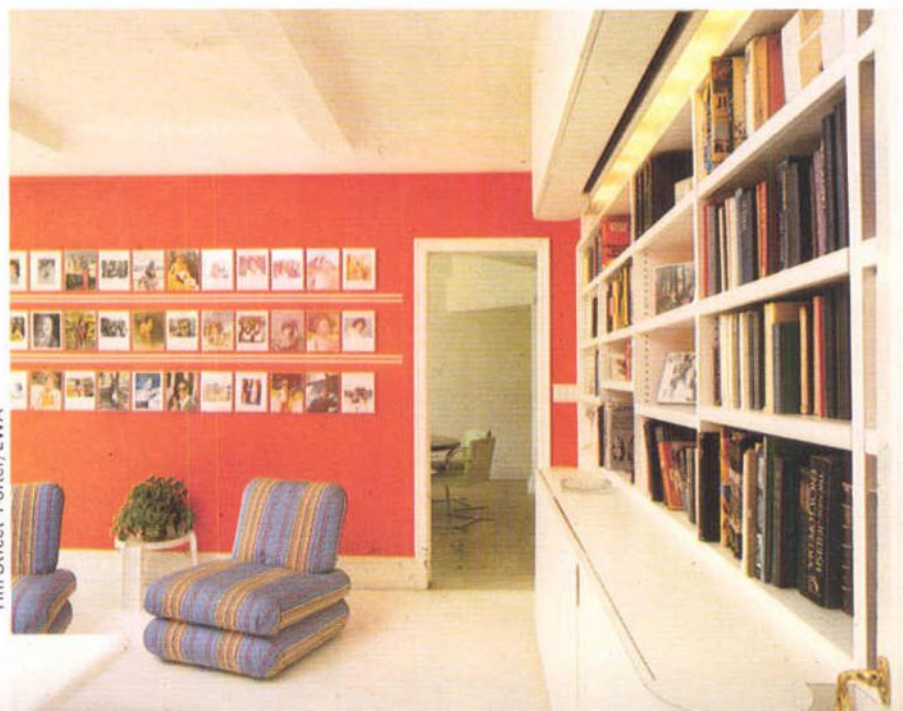
Every now and then, you may take a photograph that you are really proud of. If so, it seems a shame to leave it to gather dust in a drawer or get an occasional airing when the family album comes out. Using very simple techniques, you can mount and frame your best pictures and put them on display.

Inevitably, the first step in preparing a photograph for permanent display is to make a suitable print. Since this will probably be larger than normal and subject to close scrutiny once on display, you must take extra care to make sure that it is of the finest quality. But there are other considerations that must be borne in mind when making the print.

First, you must choose the type of printing paper to suit the way in which it is to be hung. A matt finish is generally better than gloss because a gloss print can reflect so much light that it is virtually obscured from many angles. Alternatively, you may wish to produce some particular decorative effect such as vignetting; vignetting and other decorative techniques are discussed in a subsequent article. If you want a white

Print display If you are pleased with your photographs, why not mount and display them in your home? This

not only provides attractive decoration but may also spur you on to better shots



Tim Street-Porter/EWA

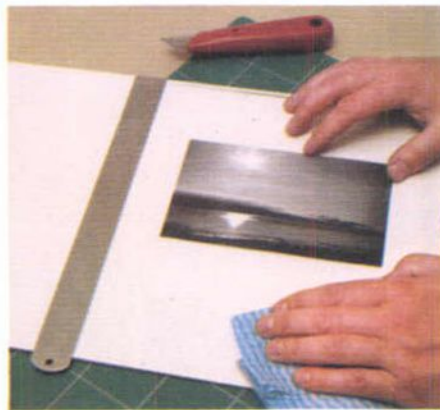
Dry mounting with an iron



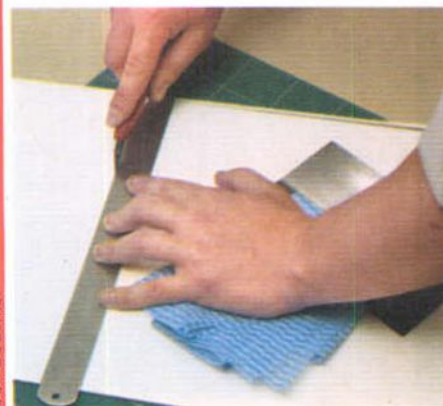
1 To dry mount a print you need an iron, a sharp hobby knife, a ruler, mounting board and a piece of dry mounting tissue. Work on a flat clean surface



2 Tack the mounting tissue to the back of the print using the side or tip of the iron. Be careful not to damage the print with the iron by pressing too hard



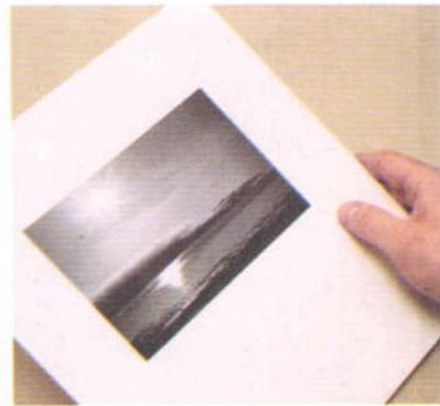
3 After trimming the print, place it on the mounting board. Make sure that the print is positioned square to the edges of the mounting board



4 Now trim the mounting board to size. For straight edges, use a metal ruler and a sharp scalpel with a new blade and protect the print with a cloth



5 Cover the picture with a sheet of protective paper. Put it in its correct position and iron gently from the centre outwards to the edges



6 The whole process takes only a few minutes and should result in a print that is mounted permanently to a professional standard ready for framing

border, though, it is usually better to make this from card rather than masking the edges of the paper during printing.

Second, you must be more careful than usual to ensure the permanence of the print image. With black and white prints, you must take care to remove all the soluble silver salts and fixer by using a hypo clearing agent and washing thoroughly for six to seven minutes—but they must be completely dry before mounting.

The dyes used in colour films and prints are all likely to fade in time and if you want to display a colour picture, it would be worth considering prints made by an image transfer process such as Kodak Ektaflex, or by a dye-bleach process such as Cibachrome. Always use fresh chemicals and carry out the processing to the manufacturer's instructions. There are spray lacquers available which help to reduce or prevent harmful ultraviolet radiation. These may also cut down surface reflections. But the most important precaution is to display the print well away from strong sources of UV light such as bright sun-

light or fluorescent lights. In general, properly processed fibre based papers withstand exposure to the atmosphere better than resin coated papers.

Once you have made a satisfactory print, you can place it directly in a professional frame, but the most durable technique is to mount it on a special board. Your choice of board may have a crucial effect on the permanence of the print. Most general purpose mounting board is like high quality thick card-board. It contains sulphur or acids that could eventually harm the print, if particular temperature and humidity conditions are present. It is worth paying a little extra for *photographic mounting board* that has a very low acid level. Mounting board can be cut with an artist's scalpel or similar sharp-bladed 'hobby knife'.

There are two basic methods of mounting prints: wet mounting and dry mounting. Dry mounting is easier and now more popular among both amateurs and professionals. It involves sandwiching a piece of glue-coated tissue between the print and the mounting board—the

tissue sticks the print to the mounting board. The seal is then completed by applying a little heat and even pressure on the back of the board.

Dry mounting tissue can be bought from photographic and artists' suppliers but you must make sure that you buy low melting point tissue if you are mounting resin-coated prints because any extra heat may affect the resin coating. Use a sheet of tissue slightly larger than the print you are going to mount.

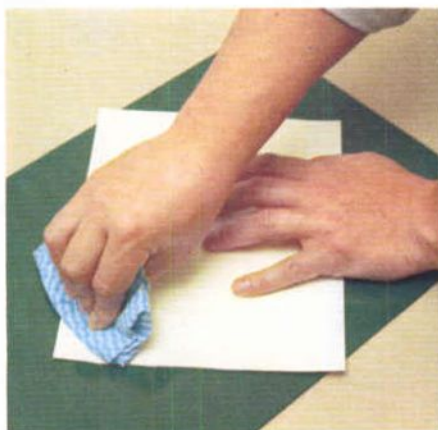
Dry mounting

To dry mount a print, you must place it face downwards on a clean surface and tack the tissue to the back, carefully heating it with the tip of an old iron at its lowest setting. Unfortunately, you cannot tell if your iron is too hot or too cold until you try tacking the tissue. If you use a steam iron, check that it contains water. Do not use a new iron as some of the glue may remain on the metal and melt again next time you iron some clothes. Professionals use a *tacking iron*, rather like a soldering iron with a flat head and you

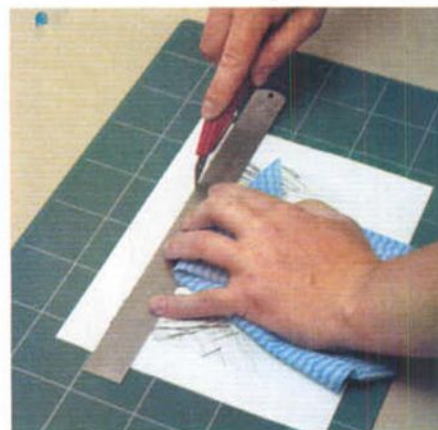
Mounting with double-sided adhesive



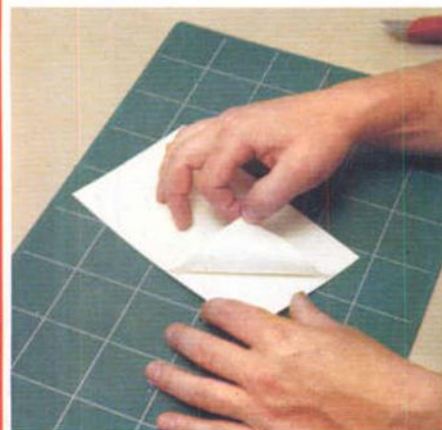
1 To dry mount a print with double-sided adhesive, first peel back the release paper from one side of the adhesive sheet cut just larger than the print



2 Lay the adhesive sheet on the back of the print and apply firm, smooth pressure with a soft cloth to bond the two together



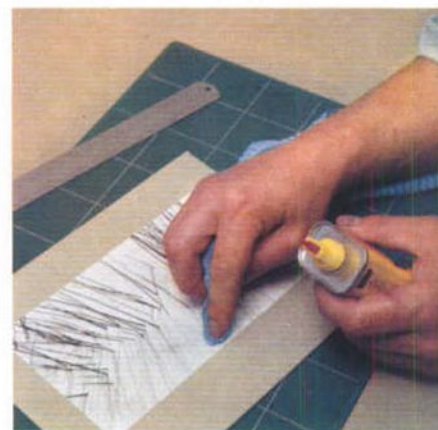
3 Now trim the print to the size you want. Use a sharp knife and a metal ruler. Protect the print from scratches and marks with the cloth under your hand



4 Turn the print over on to a clean surface and peel back the second release paper. The adhesive is now left on the back of the print



5 Lay the print carefully down on to the mounting board. Press it firmly with the soft cloth to bond the print to the mount making sure it is perfectly flat



6 Any surplus adhesive which finds its way to the print surface can be cleaned off with lighter fuel. Do this before the adhesive hardens

Jon Bouchier

may find it worth investing in one of these if you mount many prints. When using either an ordinary iron or a tacking iron, only touch the tissue very briefly with the tip of the iron.

When you tack the tissue, start in the centre and move outwards, trying not to wrinkle the tissue. Do not tack the corners.

Once the tissue is properly tacked you can turn the print over and, with a sharp knife and a metal ruler, trim the print and tissue to the correct size. Then position the print squarely on the mounting board, lift up one corner of the print and tack the corner of the tissue beneath it to the board.

With the print correctly positioned on the board, cover the print and board with a protective layer of fairly thick, very smooth unwaxed tracing paper. With the iron at its lowest setting press firmly but gently, using light, even strokes, and iron outwards from the centre of the print. Be careful not to tip the iron sideways, or you may scar the

print with the hard edges. Professional print mounters use a dry mounting press instead of an iron. This has a wide, flat platen that gives an even pressure and correct heat all over. You should iron over the tracing paper for about one minute or, if the board is very thick, about two minutes.

If, after the print cools, you discover that the tissue has stuck to the mount, but not to the back of the print, the iron was too hot. If the tissue sticks to the print and not to the mount, the iron was too cool.

Alternative techniques

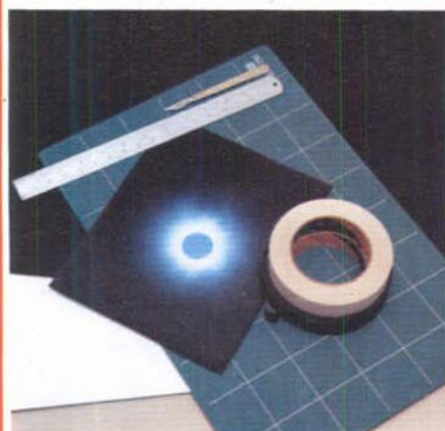
There are a few alternatives to dry mounting with tissue that are simpler and do not require heat. You can, for instance, simply cover the back of the print with double-sided sticky tape. The print then only needs to be positioned carefully over the mounting board and pressed down firmly and gently from the centre outwards.

Another way of dry mounting without heat is to buy a mounting block specially

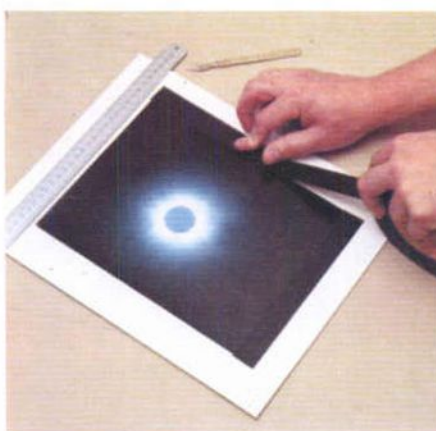
made for mounting prints. Mounting blocks are pieces of laminated chip-board or hardboard. One side of the board is covered with a layer of adhesive which is only revealed when you peel back a release paper. These blocks are usually cut to common printing paper sizes from 25 x 20 cm upwards. They are often sold with a plastic stand that can also be used to hang the print on the wall. It is a very simple, though quite expensive, way of mounting prints, but pre-cut and ready-glued mounting blocks cannot be easily adapted for borders or frames. They come complete with instructions that show you how to mount a print in less than two minutes.

If you are mounting very large prints you should try to obtain lightweight polystyrene mounting blocks. These are over one metre square and are covered with an impact adhesive on one side. The mounting procedure is to peel back the release paper and lay on the print. These blocks are used by professional photographers and exhibition designers

Making a simple card frame



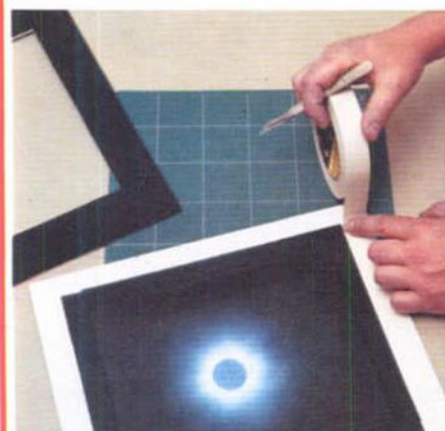
1 Mounted prints can be framed with a simple card overlay mount and bonded using ordinary adhesive tape and double-sided tape



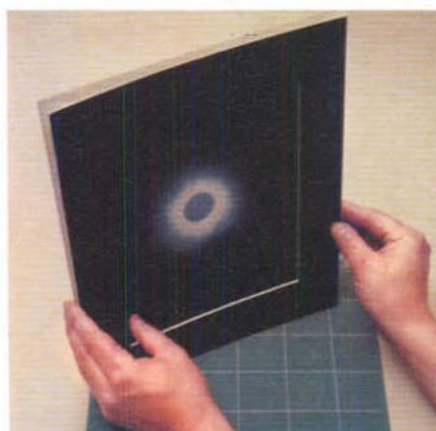
2 First tape the print to its mounting board. This need not be particularly accurate, though the print should be perfectly flat on its mount



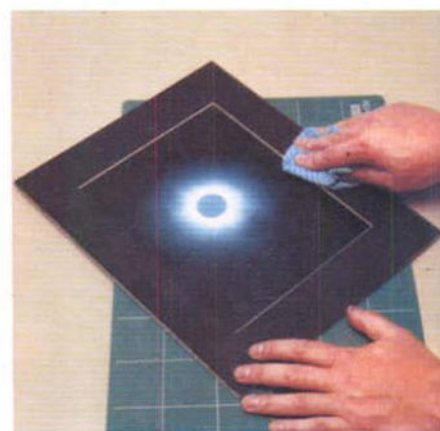
3 Cut a square hole in a sheet of card the same size as your mounting board. The hole should be the size of the print area you want to display



4 Put double-sided sticky tape around the edge of the print. Now peel back the release paper and the print is ready for framing



5 Take care when you position the card frame. Make sure that it covers the tape underneath and, if necessary, is square to the picture



6 When you are satisfied that the frame is in the right place, finish by firmly pressing the frame and mount together with the cloth

and can be easily trimmed to any size.

If you are making large prints in sections, each section should be overlapped by a few centimetres with the surrounding sections. Using a sharp knife, cut through the overlap, remove the waste pieces and stick down the remaining strips. This should give a good butt joint which, in many cases, may be invisible to all but very close inspection. Careful retouching, or even simple pencil work, can disguise the joint.

Wet mounting

With wet mounting methods you apply glue direct to the mounting board and the print. Wet mounting is messier than dry mounting systems, but does not involve heat. Some wet mounting methods allow you greater freedom to reposition a print on its mount before the glue has set.

The earliest kinds of wet mounting processes involved organic glues, similar to wallpaper paste. One had to soak the print first in lukewarm water, which

could be a messy process. In practice, most modern 'wet' mounting is sticky rather than wet because rubber-based gums or spray-on adhesives are used.

Rubber-based gums should be applied to both the back of the print and the mounting board. Once in place on the mount, the print can be repositioned and any surplus left around the board can be peeled away when touch dry. To speed up drying the mounted print can be heated slightly.

Modern spray-on adhesives, some of which are specially made for mounting prints, make wet mounting very simple. You simply spray an even coat of adhesive on to the back of the print, position the print on the mount and smooth it down from the centre outwards. If necessary, you can reposition the print before pressing it firmly into place.

Spray-on glues can be damaging to health and should be used in a well ventilated room. While spraying you should rest the print face down on a clean large sheet of paper to protect your furniture,

Displaying the print

Once you have mounted your print, you may want to frame it to complete the effect although prints on ready-gummed mounting blocks are usually left without a frame. There are a number of ways of framing pictures. You can, for instance, simply mount them on a large piece of board so that the edges of the board act as a frame, marking up the board in advance with a very soft pencil to help you put the print on square.

To make a card frame, cut a rectangular hole in a sheet of card to the size of the print. Place this over a print that has been mounted on a piece of board about 3 cm bigger than the print. You can use any strong sticky tape to attach the frame to the mounting board at the back. One advantage of this method is that you do not have to be particularly accurate in laying the print on the mounting board as the edges of the mounting board will be hidden by the frame.

Window mounting in solid frames is dealt with in a subsequent article.



World of photography

Hugo van Lawick

The wildlife of the vast Serengeti game reserve in East Africa has been the subject of Hugo van Lawick's superb photography and research for over 20 years.



Hugo van Lawick spends nine months of every year based at his encampment on the plains of the Serengeti photographing Tanzania's wildlife. Much of the rest of his time van Lawick is in London writing and preparing some of his many books on East African animals. It is these that have earned him a reputation as one of the world's foremost wildlife photographers.

Ever since his childhood in Indonesia, England and Holland, van Lawick has been interested in animals. 'Actually, I chose photography because I wanted to work with animals. I didn't know how I could find a job working with animals, until I quite accidentally got introduced to photography'. This was during the late 1950s when the African wildlife films of Armand and Michaela Denis were being shown on television.

After leaving school and doing his national service in the Dutch army, van Lawick joined a film company that made advertising films in order to learn something about film making and photography. He wanted, above all, to go to Africa and photograph wildlife but he had no means of doing so. Then, when Armand and Michaela Denis were visiting Amsterdam in 1958, van Lawick contacted them to ask for advice about

Hugo van Lawick at the window of his Land Rover using a specially fitted mount for his camera system

Serengeti silhouettes A male lion following two lionesses across the horizon of this vast game reserve



Hugo van Lawick



starting wildlife photography. 'How many thousands of feet of film have you shot?', van Lawick was asked. He recalls now that he had not even shot one thousand. Armand Denis advised van Lawick to take any job he could find in Africa and then practise photography at weekends. Unfortunately the 20-year-old van Lawick found it impossible to get work in Africa from overseas and he wrote to the Denises saying that he had decided to go to East Africa anyway to look for a job.

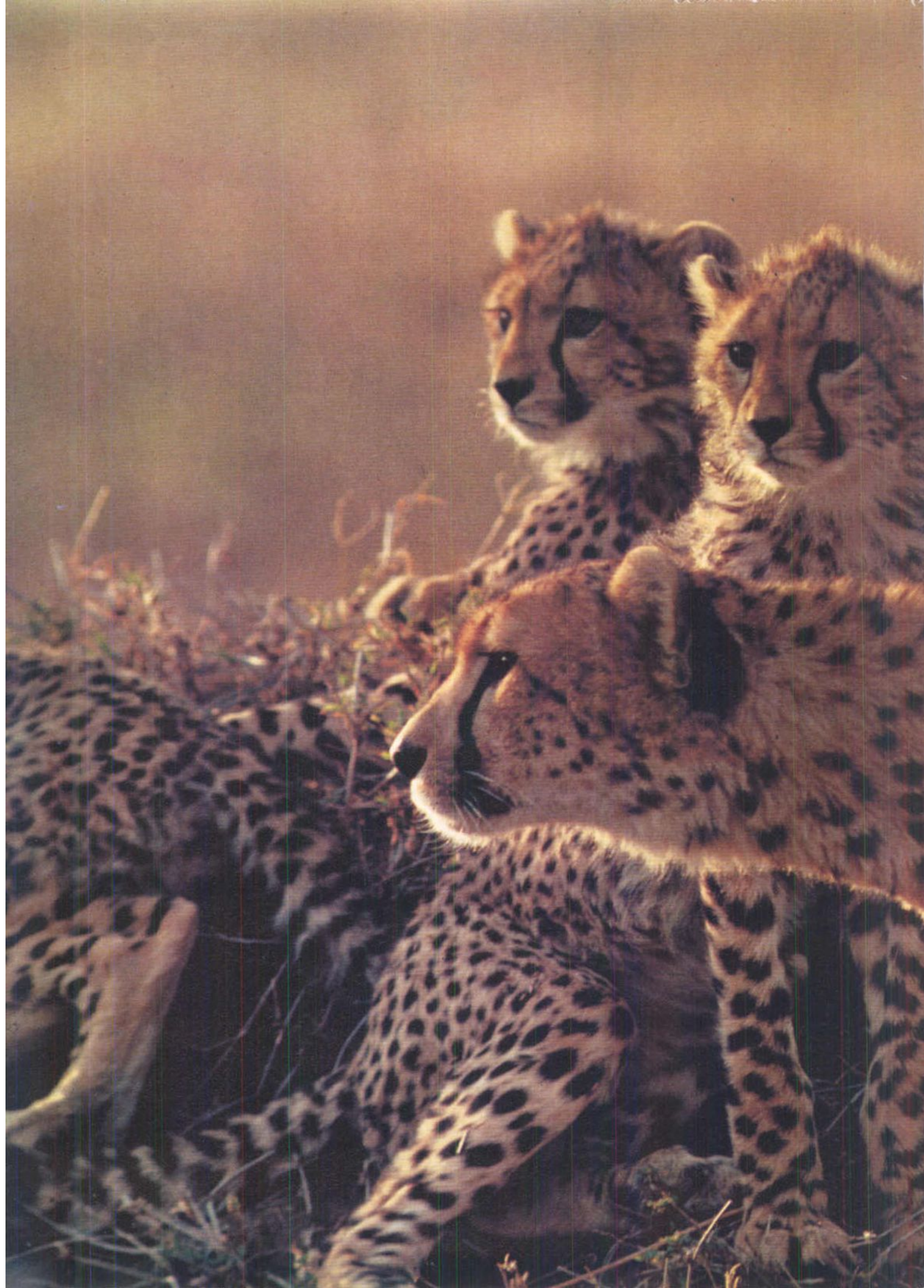
Van Lawick's break came when the Denises wrote back to say that they had just lost one of their cameramen—would he like to join them? After working on a number of films with the Denises, he moved on to join Tanzania's game department. Van Lawick's job was to bring rhinos out of heavily poached areas and release them into national parks. It was while he was with the game department that he saved enough money to buy a secondhand camera and some film. He eventually left with one month's money in hand, determined to be a freelance photographer.

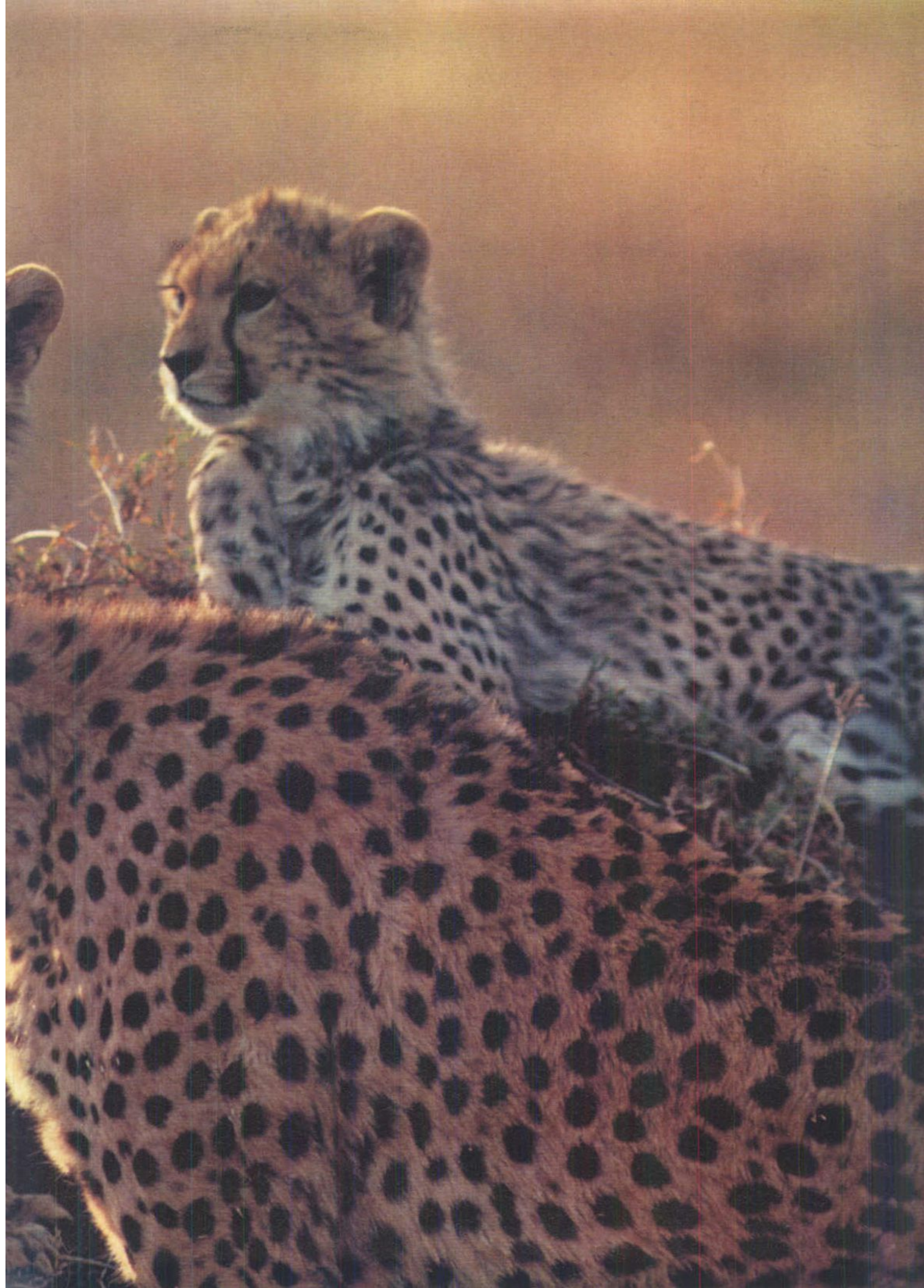
It was not long before Dr Leakey, the internationally known palaeontologist working in East Africa, heard that van Lawick was freelancing without much money and invited him to stay at his house. Just three days later the National Geographic Society rang Leakey because they urgently needed a nature

Deserted cub Lionesses often desert their young when they go hunting. Van Lawick used a 400 mm lens

The superb starling taking a bath at van Lawick's camp, captured with a 560 mm lens







film. Could Leakey suggest anyone who could do the job within six weeks? Van Lawick recalls that he was standing right behind Leakey at the time of the call and so he got the job.

The film was so well received that National Geographic invited van Lawick over to Washington. They wanted to see how good his still photography was so they asked him to go out and photograph people on the streets. Van Lawick recalls that the experiment was not a success. He had had no experience of photographing people. He was not used to talking to them and relaxing them—nor was he familiar with the techniques of 'snatch' photography. This sort of photography is almost the exact opposite of van Lawick's true love—waiting patiently for hours on end for the animals of the Serengeti.

When he goes out to photograph animals, van Lawick travels alone. Antelope, elephants, chimpanzees, the big cats and the hunting dogs may be his only companions in the daytime. He has a staff of four Tanzanians at his basecamp at Lake Ndutu on the Serengeti, but he only rarely does he take one of them on a trip to assist with the photography or driving.

'Sometimes, to get the right view, you may want to get to within an inch of a particular spot. I might decide, for instance, that I will photograph through vegetation and the only way to do that is to put your eye to the camera and drive



Attempted escape A Thomson's gazelle catapulting backwards over a wild dog in a vain attempt to escape. Van Lawick's only picture of this rare event

slowly to the right position. A driver would get bored stiff. Most of my time is spent sitting waiting, sometimes for whole days.'

Lawick recalls once staying awake for three nights and three days in the hope of photographing a hyena kill. He

eventually fell asleep with his head hanging out of the window, waking up at 9 am to witness the remains of the kill that he had slept through! He emphasizes the importance of exploring any subject as fully as possible, firm in the belief that you do not get good pictures by snapping on the move. 'You need to stay around, often for a long time, until you get pictures that record something.'

Van Lawick's home is actually in the Serengeti. By 'home', he means his tents.





Pink flamingos *A young hyena chasing its prey which are at a disadvantage in their crowded feeding grounds*

Lioness and cub *Van Lawick took this charming picture from a low viewpoint only twenty metres away from his subject*

Bull elephants feeding *There are more elephants per square kilometre in the Serengeti than anywhere else in Africa*

He has a dining room tent, an office tent, a bedroom tent and a library tent. From this base he goes off with a small tent and camps wherever the animals are.

Living so close to the subjects of his photography has its advantages. Van Lawick prefers to work in natural light, especially in the early morning and at dusk. He can then make the most of the astonishing beauty of the natural light, the clouds and the sunsets. 'When I first started photographing my main concern was lighting—to get an artistic effect. I then became much more involved with the behaviour of the animals, so that lighting became completely secondary. Over the last few years I've tried to get a combination of both, which is very difficult. What I was hoping originally was to get landscapes, which I've trained myself to do over the last few years, and, at the same time get these action pictures. But that was asking too much because I found I was concentrating so much on looking for landscapes that I would miss the action picture.'



Hugo van Lawick

Van Lawick may have a feel for a good picture, but he has never studied photography and says he is not technically minded. He was once asked to lecture at Stanford University on film making but declined because of his lack of technical training.

He uses a Leica with a 400 or 560 mm lens for most of his still pictures of the larger animals. For chimpanzees, however, van Lawick is sometimes able to use

a 105 mm lens if he can get reasonably close to them. He occasionally uses a polarizing filter for accentuating cloud effects, and this is his only filter. He finds Kodachrome 64 the best film for his type of work because it is fine-grained and gives him the speed he needs.

In over two decades working with animals, van Lawick has had a number of close shaves. He was once chased by an elephant and, although he was in a car



Hugo van Lawick

at the time, the elephant's tusks were just over a metre away. He is generally phlegmatic about the dangers of animals attacking him. He believes that although elephants could completely wreck a car, they do not actually realize how weak a car is. He adds that there is no doubt that the elephants he was watching had begun to recognize his car.

'Finally they took no notice of it. And it was great to be surrounded by animals like that. I like watching any animal when it takes no notice of me. When you watch an animal as big as an elephant, it's a very impressive feeling.'

Captive animals are different in that, in the case of chimpanzees for example, they may have played with humans when young. 'He either knows or has a sneaking feeling that he can probably tackle humans. I was filming a captive chimp—which, when full grown, would be four times as strong as man—he wouldn't attack me but he did once attack a visitor to the camp. I tried to rescue her, and then he turned round and attacked me.' Van Lawick explained that it is vital to chase off a chimp that has attacked because if you do not, the chimp will assume he has dominated you in accordance with the rules of his own hierarchy. He will then continue to attack on every meeting. Van Lawick concluded 'It was a year later when I was shaving and I saw the scars that I realized that he missed

my jugular vein by millimetres.'

Despite such experiences, van Lawick's Land Rover is not reinforced in any way, nor does he carry a gun. He says that animals are usually bluffing when they appear to be attacking, and in any case it would be difficult to carry a gun as well as a camera and film. 'You could carry a revolver but there's not much chance of shooting an animal dead with a revolver. If I'd had a gun all the time I've been in Africa, I might have shot only three or four times in self-defence. As it turned out, the shot would have been unnecessary because the animal didn't attack. And that is in over 20 years.'

The only hazard that van Lawick does acknowledge is dust. He cleans the cameras frequently with a small paint brush and a can of pressurized air. 'You feel it's a lost battle because as you're brushing dust off, more settles. If you didn't do it, more would build up—but it is very frustrating.' Fortunately for van Lawick, the air on the Serengeti is fairly dry and he does not have to cope with the problems of humidity found in West Africa.

Out of van Lawick's years on the Serengeti have come a number of lavishly illustrated books, showing how the animals eat, court, live and die. These include *Savage Paradise* and *Solo: the Story of an African Wild Dog*—one

Ngorongoro Crater Sometimes up to a million flamingos can be seen feeding on the salt deposits of the soda lakes

of van Lawick's most celebrated achievements. His first book, *Innocent Killers*, had been commissioned by Collins, and was originally intended to deal with the large predators—lions, leopards, cheetahs, hyenas, jackals and wild dogs. Van Lawick soon discovered that much of what had previously been published on the subject was incorrect and that it would be impossible to study all the animals thoroughly within two years. So he and his ex-wife, Jane Goodall, concentrated on the predators of the Serengeti—hyenas, jackals and African wild dogs.

As he photographed the wild dogs, so he studied them. Through his painstaking observations he found out much about life in a wild dog pack that surprised the scientists who had studied them.

When van Lawick first went to Africa he had thought that he would stay for a short while and then move on. He had ambitions of travelling all round the world photographing animals. When he settled in East Africa, however, he became so enchanted by its beauty that he has never moved on. Instead, through his photographs, he has managed to share that beauty with a much wider audience.

Buying secondhand

Great savings can be made by buying secondhand, rather than new, equipment and you may be able to purchase items that you could not otherwise afford. But you should know exactly what to look for

Every year millions of new cameras and lenses reach the dealers' shelves, and an almost equal number of used items are part-exchanged, discarded, sold privately or left in drawers. Some of this old photographic equipment is outdated, damaged, obsolete, or simply out of fashion. But much of it is recent, hardly used, in very good condition and still current in the manufacturer's catalogues. As secondhand photo goods may cost anything from 30 to 80 per cent of the new price, there are substantial savings to be made—as long as you know how to distinguish between bargains and rubbish.

Particularly worthwhile savings can be made by purchasing lenses secondhand. You may be able to pick up a top quality used lens, for instance, at the same price as a new but inferior quality rival. In this case, the used lens is often by far the best buy. Similarly with simple items with little to go wrong, such as tripods, buying secondhand can give you good quality equipment at low cost. Only with elaborate equipment such as light meters can buying secondhand be more trouble than it is worth.

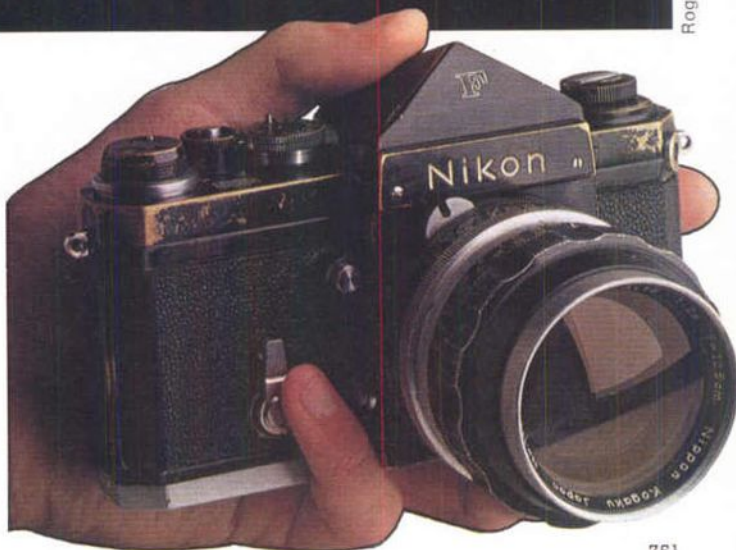
Used photographic equipment can be bought from a number of sources, but the most obvious are private advertisements in the photographic press and local paper and specialist photographic dealers. Many of the larger photographic stores have a counter dealing specifically with secondhand equipment and can offer a fairly wide choice. One of the advantages of buying from a dealer is that the equipment is often there, ready to buy, and you may be able to try out several different items at the same time. Dealers may also provide part-exchange and hire purchase facilities. More importantly, by going through a dealer you avoid some of the inevitable risk of buying faulty equipment. Few dealers will risk their reputation by selling a camera they know to be faulty. Some offer an official guarantee, but even if not, they may be sympathetic if anything goes wrong—there may also be some legal comeback in some countries.

Unfortunately, dealers add the cost of all these extra services to the price of the equipment. They also have to include tax and profit. So secondhand equipment from a dealer may be considerably more expensive than equipment bought privately. If you decide to look for a bargain by buying secondhand, you must be even more careful to ensure that you are buying sound equipment—unless the



Roger Payling

Careful choice
Whether you buy privately or from a dealer, it is important to examine and, if possible, test equipment carefully before purchasing. A great deal can be deduced from the general condition of the item. Although a certain amount of wear is acceptable, excessive wear or damage is not





include looking through the viewfinder to ensure that the screen grain and the detail of the focusing aids, readouts, and so on are clearly visible. The screen grain should be evenly sharp from corner to corner—any blurring towards one edge shows misalignment. Examine the mirror through the mount for dust or smears. Open the battery compartment and check for damage by old batteries. The shutter should operate smoothly and positively. Wind on several times and fire the shutter at all settings. Any camera that shows excessive hesitation at slow shutter speeds is to be avoided. Open the camera back. Set the shutter to B, and examine the camera inside while holding the shutter open. Watch the shutter close—there must be no sluggishness in operation.

To check for flash synchronization, you must either take your own flashgun or borrow one from the dealer. Fit the flashgun and set the shutter to flash synchronization. Open the back of the camera and look at the shutter with the camera aimed at a plain white surface. When you fire the shutter, you should see the whole of the lens mount and film gate illuminated by the light of the flash coming through the camera. If the camera has both hot shoe and cable socket connections, repeat the test for both modes. If you do not see the whole frame illuminated, the synchronization needs adjusting.

If you are buying a camera, it is well worth taking along your own camera to make comparisons, although some dealers may allow you to borrow new equipment. Built-in exposure meters can often give trouble in secondhand cameras and your camera (or a spare meter) can provide a useful reference point for checking metering performance. If the vendor agrees, take the camera you wish to buy and your own camera outside and check exposure readings at several film speed settings. The used camera should give readings within half an f-stop of your own camera—providing, of course, that your own meter is working properly.

Correct synchronization All of the film gate is illuminated by the light from a correctly synchronized flash

Checking for faults More specific checks you can make include looking for dust or smears on the mirror, making sure the size and shape of the lens aperture are consistent for each f-stop, and checking the battery compartment for damage

corners, marks from neckstrap fixings rubbing the casing, and so on—but as long as the wear is not excessive, it should not have any adverse effect on performance. Accidental damage, however, may have more serious consequences. Small dents, deep scratches or distortion of any part of the exterior may conceal serious damage or misalignment inside. If the leathercloth coverings are slightly detached from the body at the edges, then they may have been removed for repairs. When examining cameras, look at the small holes in the centres of parts like shutter dials. These have a screw head which can be undone only with a special key. Any scratches near these holes, or marks on or near screw heads, are usually evidence of amateur repairs.

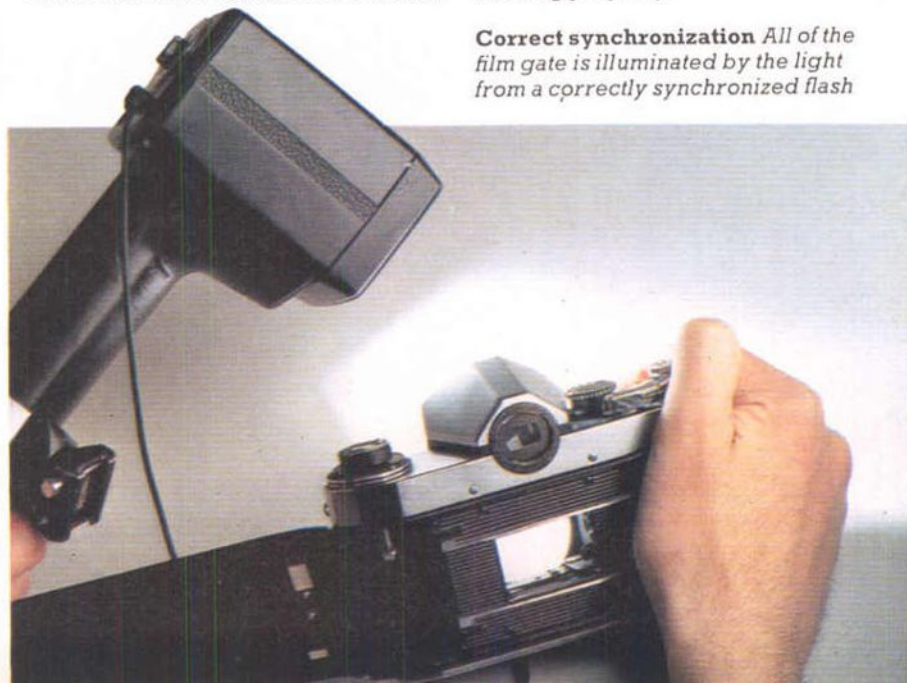
Other checks on secondhand cameras

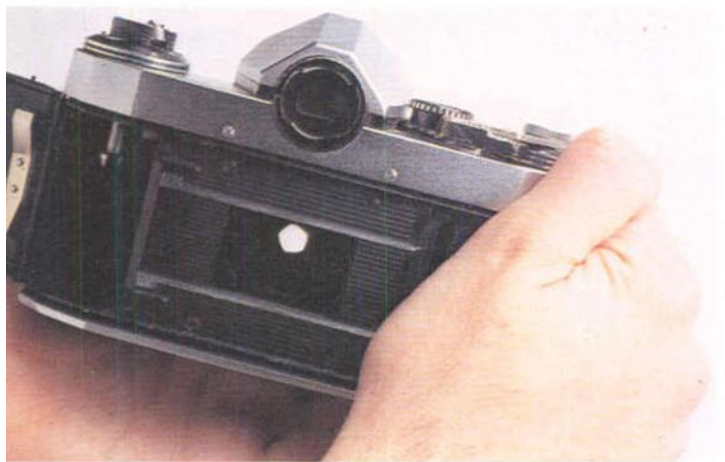


item is sufficiently new to be still under the manufacturer's warranty, there is little comeback on faults with equipment bought privately.

There are some simple ways of checking for some of the more obvious faults in equipment before you buy. First of all, ask for any cases, instruction books or accessories which go with the item. Sit down and read through the instructions. Examine the equipment and make sure that every part mentioned is there. Cables, connectors, lenscaps, accessory shoes, lenshoods and so on are often missing.

Then examine the exterior of the item. Clearly, any used equipment will show some signs of wear and tear—worn





Check all LED displays, needles and other readouts. If possible, load a film to check film advance, safe load signals, multi exposure switches, and the rewind.

Finally, using a standard lens, try to focus on a subject at least 30 m away. This must be in perfect focus with the lens on the 'infinity' setting. If it will not focus properly on distant subjects, the focusing screen, mirror or lens mount may be out of alignment—any possibility of a lens fault can be ruled out by testing the lens in a second camera body.

Lenses should be checked for the proper functioning of the aperture blades. Remove the lens, and set it at each *f*-stop in turn. Look through the lens, and, for each *f*-stop, press the stop-down lever and release it a number of times. The aperture should always be the same shape and size for any one *f*-stop.

Another test to make on lenses is to turn the focusing ring fully from close to distant focus. It should move smoothly without stiffness. It should also show no signs of sloppiness or movement when pushed from side to side. Make the same checks with zoom rings and the aperture ring on the lens.

Fit and remove the lens and camera body several times. Check that the bayonet mount is not loose when it is fully home. With screw thread mounts, check that the lens top index is at 12

The shutter Any sluggishness in the shutter blinds may mean that speeds are inaccurate

Infinity focus Use a standard lens to check the focusing screen and lens alignment

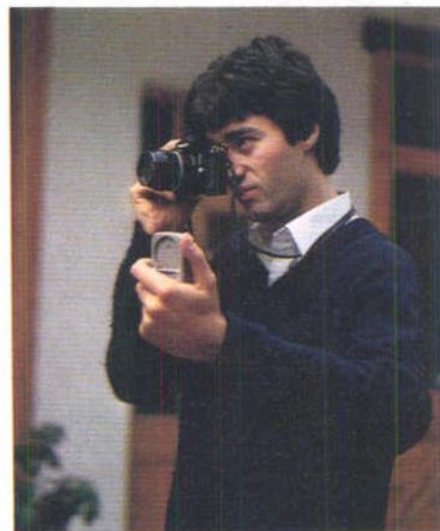
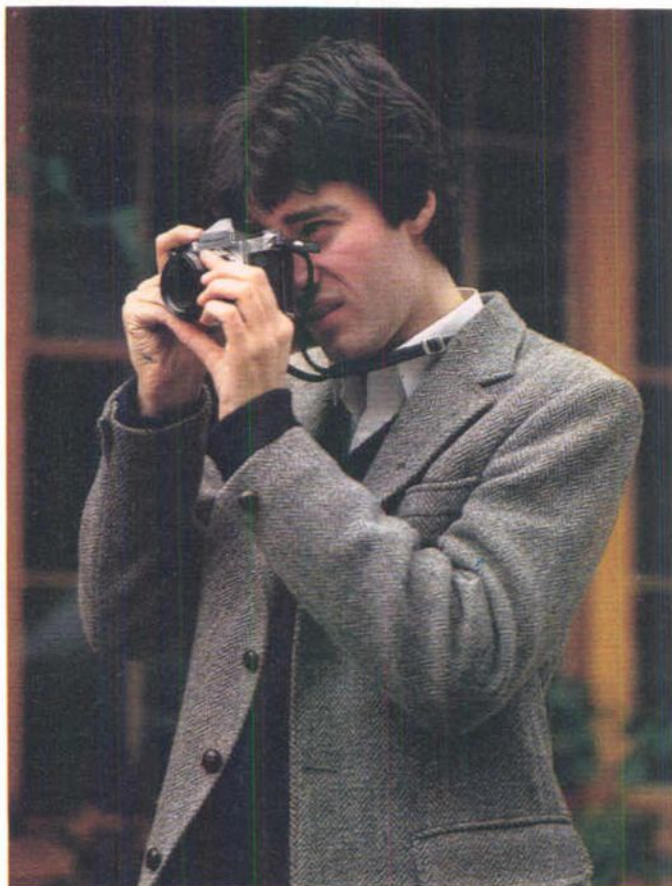
Meter checking Compare the meter in the camera with one you trust

o'clock when fully screwed home. Hold the lens up to the light, set at full aperture. Look through each end. Small dust traces or a few fine scratches do no harm but fingerprints, heavy dust or clouding may need professional cleaning.

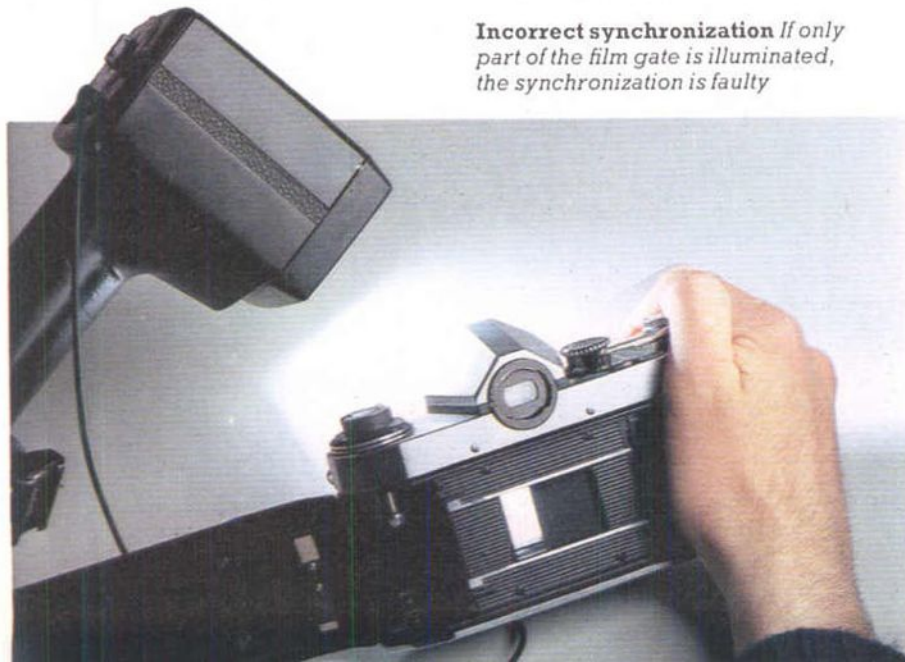
Buying from distant private sellers, secondhand shops, or unknown individuals can be risky. But buying secondhand photographic equipment can save you considerable expense if you check carefully, buy good quality items rather than aim for very low cost, and buy either locally or from a reputable dealer.

The main advantage of buying secondhand is that the goods are cheaper. When considering a particular item, you

Incorrect synchronization If only part of the film gate is illuminated, the synchronization is faulty



Roger Payling



must make up your own mind as to whether the savings are worth the possible risk of buying poor quality or faulty equipment. If there is only a small saving you would be well advised to favour new, guaranteed goods rather than secondhand equipment of unknown pedigree.

Finally, always remember that there is more chance of being able to bargain for secondhand goods than there is with new. If you are prepared to offer cash, and make a sensible offer, many dealers will be happy to accept rather less than their advertised price. But make sure that this does not affect your chances of being able to return the goods should they turn out to be faulty.

Solarization and Sabattier effects

Fogging or massive overexposure of film or paper seems an unlikely way of producing interesting images. But many dramatic pictures are produced using this principle

hand, contain less silver and cut off less light from the second exposure. The result is that the highlights blacken more quickly than the shadows.

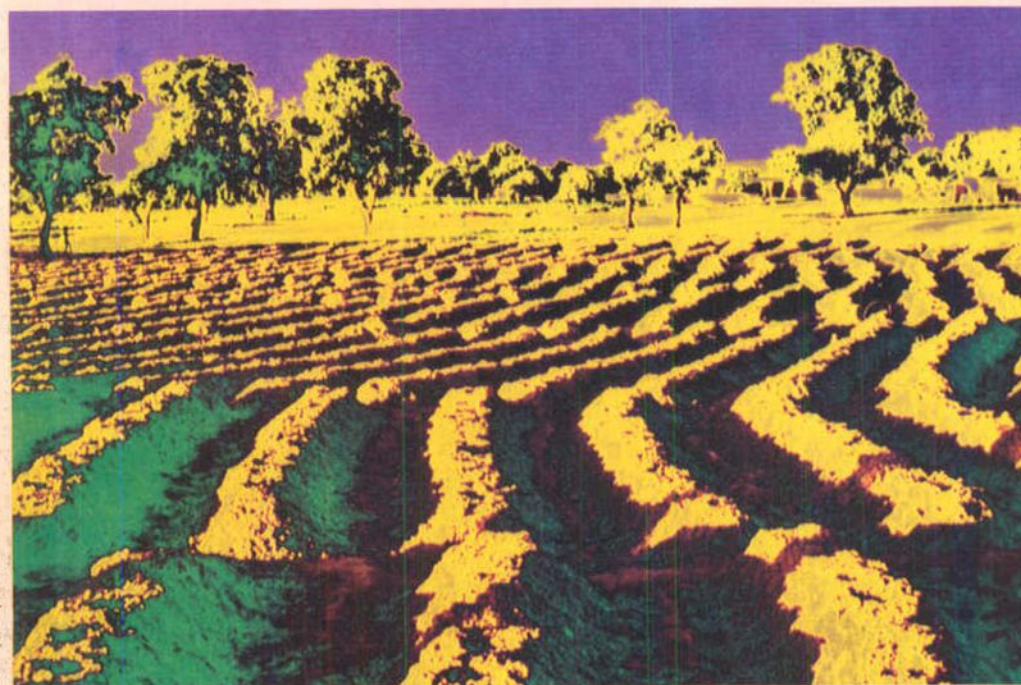
Solarization

An overall fogging exposure in the middle of development can also be responsible for solarization. Nevertheless, although solarization and the Sabattier effect look similar, solarization takes place for quite different reasons. Unlike the Sabattier effect which can only take place during development, solarization is due to excessive exposure at any time.

In a normal exposure silver bromide and iodide are reduced by the action of the light in the exposed areas of the picture—that is, they are chemically changed to form metallic silver, and bromine and iodine ions. The bromine and iodine—both referred to as *halogens*—are usually absorbed by the gela-

Furrows Sabattier effects can produce dramatic changes in both tone and colour

Old man Sabattier effects can also be muted, and the original colours remain recognizable



Hervy/Explorer

Of all the techniques for creating special effects in the darkroom, few can transform an image more dramatically than those based on a phenomenon discovered by a Frenchman, Armand Sabattier, in 1862.

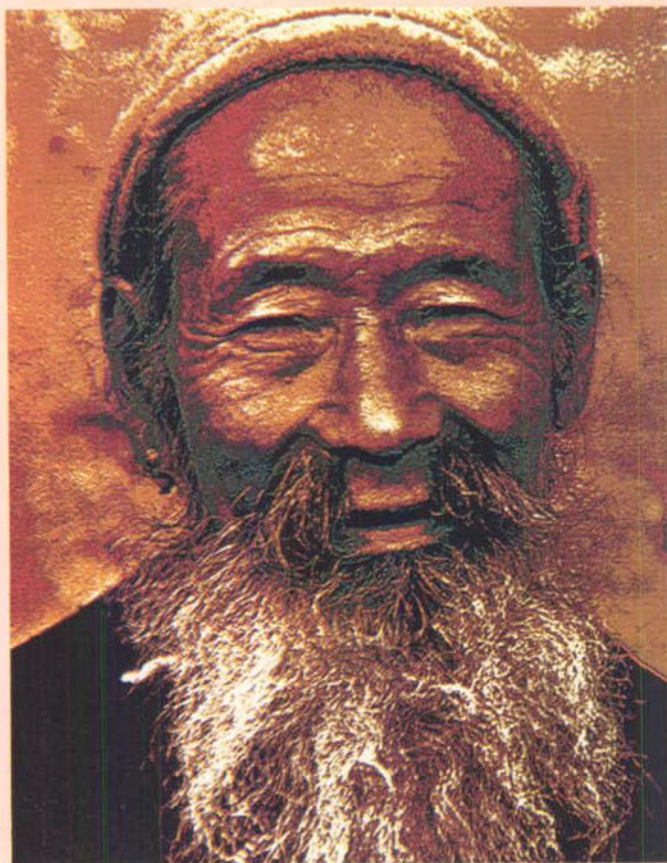
Sabattier noticed that if a wet collodion plate negative was exposed to light during development, the image was partially reversed and became positive. Modern films and prints are similarly reversed by exposure to light during development. This phenomenon, now known as the *Sabattier effect*, is often confused with a similar reversal effect known as *solarization*, and indeed, the technique for using the Sabattier effect is sometimes known as 'pseudo-solarization'.

You may see the Sabattier effect for yourself if you switch on the white light in the darkroom while a print is still in the developer. The print quickly turns black, but it does not blacken evenly—pale areas go black more quickly than the dark areas.

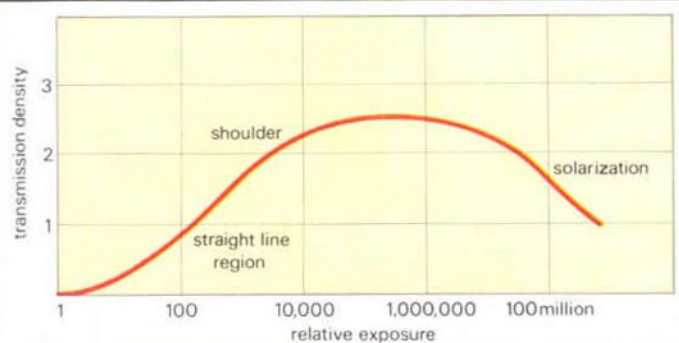
The original dark areas, however, do not blacken significantly more, resulting in a dark but reversed image.

A number of theories have been put forward to explain the Sabattier effect. Some experts suggest that the first exposure—the normal exposure under the enlarger—actually desensitizes the emulsion of the paper or film to the second, fogging, exposure. This reduction in sensitivity is thought to be caused by the products of the development process, so the effect is strongest in the areas of the picture where the developer acts most strongly—those areas which have had most exposure.

The most convincing explanation, though, is that the first image that appears on the paper actually forms a mask, or stencil. The metallic silver in the shadow areas absorbs much of the light from the second exposure and when the white light is turned on, these areas are actually less heavily exposed. The highlights, on the other



Berthoule/Explorer/Vision International



tin of the emulsion or within the lattice of atoms in the silver halide crystal, and so have no further effect on the process. When a piece of paper or film receives a massive overexposure, however, bromine and iodine are released in large quantities, and the emulsion cannot cope. The halogen atoms recombine with the silver of the image, forming silver halides. Some of the silver that would otherwise form the image is therefore lost and the result is a reduction in density.

In fact, this drop in density would be seen on the characteristic curve of a film (see page 131), if this were extended far enough. Photographers are not normally interested in anything beyond the shoulder of the curve because this marks the point where, however much extra exposure is given, no increase in density is produced. If the film is given an exposure a million times that necessary to produce the maximum density, the curve begins to fall once more, indicating that solarization has taken place. This would happen on every film if manufacturers did not take steps to prevent it.

Characteristic curve Past a certain point, extra exposure results in a decrease in density. This is the area of solarization

In practice

Although at first it might seem unlikely that a photograph would receive a million times too much exposure, a picture which includes the sun has a lighting ratio in excess of a million to one. If something was not done to prevent solarization, the sun would appear on a print or slide as a dark disc.

To prevent this, special chemicals are added to the emulsion of the film during manufacture. These combine with the bromine and iodine

as they are released, and prevent them recombining with the silver image. As a result, modern films rarely suffer from solarization.

Nevertheless, solarization can be very useful and some manufacturers produce printing paper that uses solarization to give a positive image directly without an intermediate negative.

This kind of printing paper, which is usually called *auto-positive*, is used to get a rough positive copy from the transparencies that printers use for book and magazine production. The contrast of such paper is very high, and quality is rather poor, but it makes it possible to make a black and white print from a colour slide very quickly.

In the darkroom, however, the Sabattier effect, or pseudo-solarization, is more useful still. It is produced most easily with high contrast materials such as lith film, very hard bromide paper, and colour printing paper. Unfortunately the degree of control is limited, and it is almost impossible to repeat pictures, because the appearance of the final image is

affected by many factors—the intensity of the first and second exposures, the duration of development and the agitation of the film or paper.

Outlined images

One of the characteristics of images which are produced by the Sabattier effect is that they often have prominent lines between areas of dark and light tone. These lines are called *Mackie lines*, and are caused by exhausted developer flowing from the dark areas of the picture on to adjacent less heavily exposed areas. Here the high concentrations of alkali bromide in the exhausted developer restrain development of the fogged pale tone, and a sharp line of low density appears.

If the Sabattier effect is used to manipulate a negative or print, the result is usually very dense and almost opaque. For this reason, such images are usually copied to produce a paler final image. This increases the contrast of the result, and makes the lines between areas of dark and light tone even more prominent.

Bright lines Characteristic 'Mackie' lines produced by the movement of exhausted developer between areas of dark and light tone after Sabattier re-exposure

Monochrome Sabattier The basic effect can be judged from this negative print. The tones are not simply reversed, as they would be with a normal negative—some parts of the picture have remained positive



Jacques Joffe/Explorer



Ethel Hurwicz



Creative approach

Portraits indoors

Portraits taken by available light indoors too often yield only simple likeness pictures. But by using its peculiarities, available light can transform portraits into telling personality studies



Trevor Wood

Available light indoors is ideal for portraiture, in which good results depend so much on a relaxed and informal atmosphere. Although outdoor lighting can clearly be more varied, and the results may be more spontaneous, you have very little control over the quality of light or the weather conditions. On the other hand, in a studio setting with artificial lights you may find that the very formality of the situation puts pressure on both model and photographer, and the results can easily appear contrived.

An ordinary interior, however, allows the subject to relax in a fairly natural environment, while allowing you some control over the illumination. This is obviously desirable when photographing portraits—and indeed many photographers who specialize in informal portraits, rather than the stylized formal pictures, prefer to use available light without resorting to flash, which can totally destroy the mood of a shot and produce unforeseen results.

At one time, photography indoors with out extra lighting was regarded as an extreme approach, only to be attempted if there was no alternative. Today, improved films and lenses make it possible to take pictures indoors with few problems. Many beginners' results are poor not because of lack of light, but because they are not sufficiently aware of the nature of available light—in particular, its high contrast. Each of the possible in-

Ed Barber

Girl in chair *The diffuse light from a window can be ideal for portraits. The light becomes more diffuse as you move away from the window*

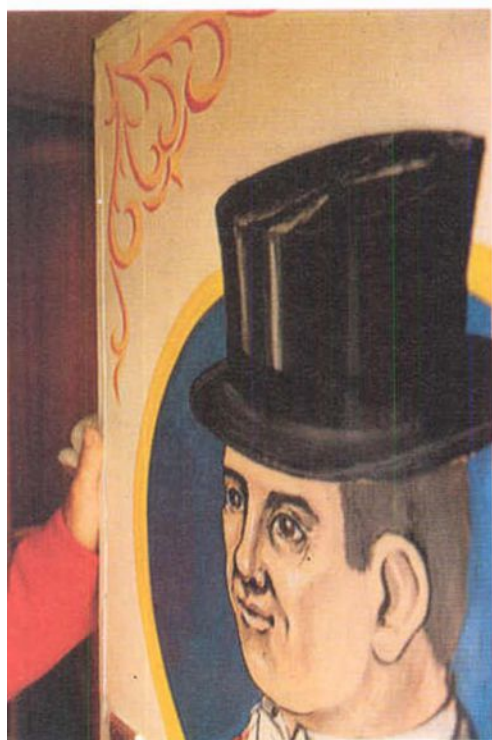
Ringmaster *This colourful portrait, by clever and careful posing, tells us something about a man, who is very proud of his own image*



Homer Sykes



Quentin Crisp *Your subject need not fill the frame to make a successful portrait. The details of the room can reveal a great deal about a personality*



door light sources has its own peculiarities and uses. You may not always be able to pick and choose the light source, but if you know the type of results which each will give it is possible to achieve a wide degree of control.

When photographing people, you must think more carefully than usual what effect you are aiming for. This depends on the relationship between you and your subject, and who the picture is for. If it is for the subject, they will expect to be seen in a flattering light—or at least not unflattering. On the other hand, if the picture is for you, you may want to reveal a particular aspect of the subject's personality. Either way, the way you handle the composition and the lighting will have a profound effect on the result. Achieving either a flattering light or one which will reveal aspects of your subject's personality depends on knowing how each source of available light will appear on film.

Indoor lighting by day varies from direct sunlight pouring through a window, to diffused window lighting reflected off walls near the centre of a room. Artificial lighting may vary from the stark illumination given by a single overhead naked light bulb to the diffuse glow of wall lights. In addition, there may be movable lights such as desk lamps and lamp standards. The light on your sub-

ject can be a combination of all these, or you may be able to vary the light by turning lights off, moving them around, or drawing curtains.

Each type of light has its own characteristics. Direct sunlight indoors is the most contrasty and 'hard' of all. Sunlight streaming through large windows may seem the obvious choice of illumination. There are problems of excessive contrast, however, with the risk of large black areas. In many cases it will be preferable to diffuse the light in some way, or to use reflectors. You may, for example, hang a white bedsheet over the window to diffuse the light, or use white reflectors (newspapers or bedsheets will do) to reflect light into the shadows. This could look unnatural if overdone, since one does not expect to see large amounts of diffuse light coming from inside a room. Alternatively, a Venetian blind on the window throws patterns on to the subject, giving an unusual effect with its own value in creating a mood or helping to mould a subject.

Direct sunlight can provide very dramatic lighting conditions, and has produced many successful portraits, both in classical art and in photography. It is, however, often tricky to handle both aesthetically and technically. Watch out for ugly shadows on the face, and use your light meter close to the subject to

take readings of highlights and shadows. Your exposure should be an average between the highlights and the darkest tone you expect to show clearly with no more than about four stops between them.

Much of the drama of sunlit indoor portraits, however, stems from the way the subject is picked out in bold relief, so this approach may be worth using where the background is cluttered, if it can be kept in shadow.

On an overcast day, or when no direct sunlight is shining into the room, the light is more diffused, but still very hard and directional. The farther you move into the room the more diffused it becomes as reflections from the walls gain strength. The degree of diffuseness

George Cole *The image of the actor's face was burned out during printing*

Afternoon sunlight often yields a mellow, peaceful portrait

depends on many factors, such as the furnishing and wall covering, and the room's aspect—a basement with a window will have light coming mostly from the upper half of a window, while an upper storey flat will have a good deal of light on the ceiling. Such light can be quite diffuse and flattering, and is even enough to allow you to move around trying different angles, rather than forcing you and the subject to remain in more or less one spot.

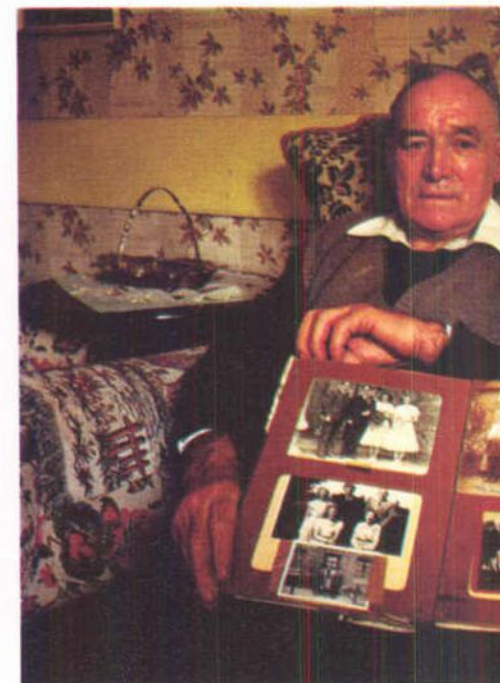
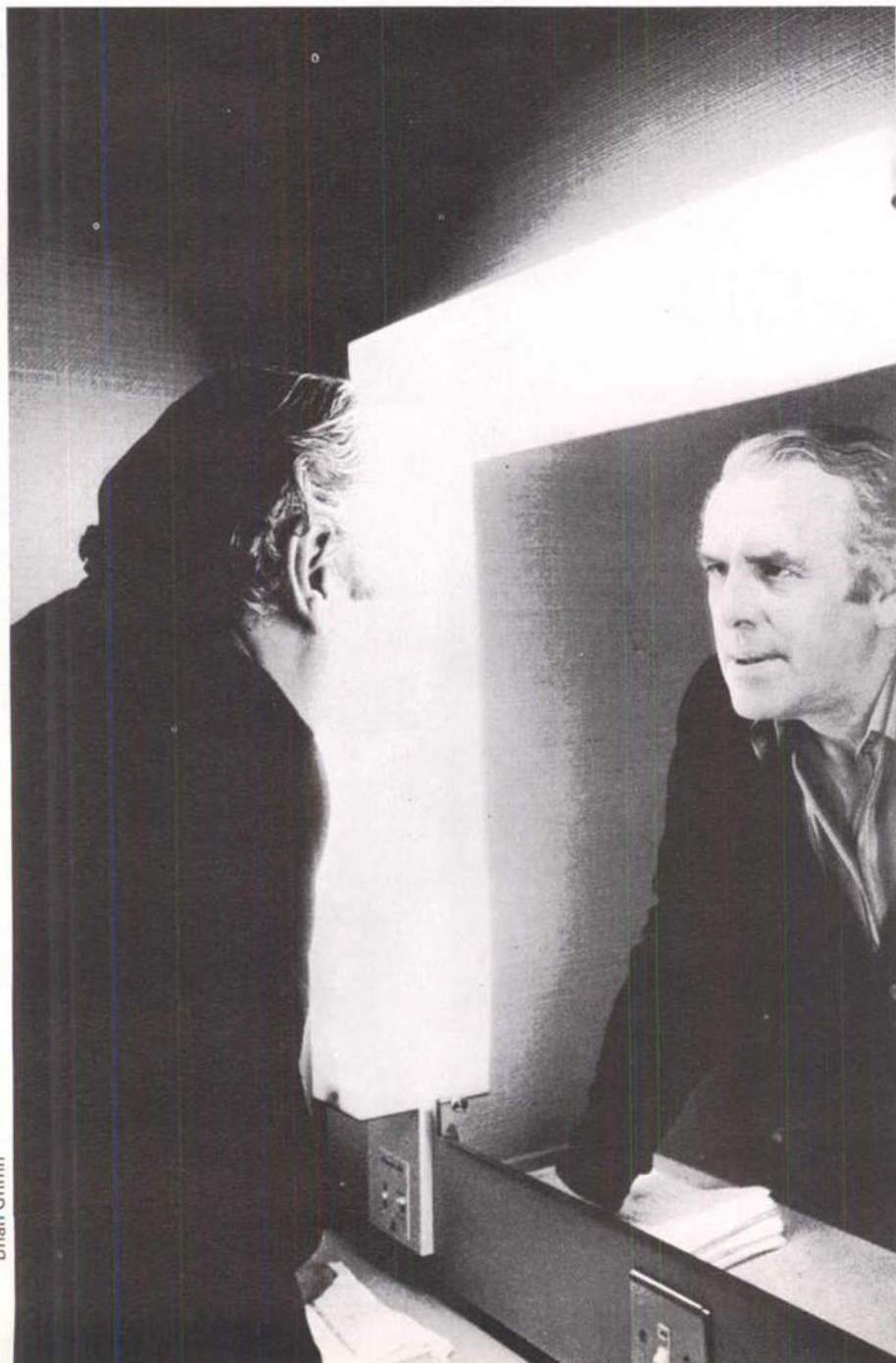
Artificial lighting is often very contrasty. This can be surprising, as it is not noticeable in everyday life. Film, however, is far more susceptible than the eye to contrasts of light and dark.

A single overhead lamp, whether or not it has a shade, gives a very harsh light. This gives a stark appearance to the picture, but is very restrictive unless you want this sort of effect, which often suggests poverty or loneliness. Where more than one light is available, how-



ever, a softer effect is possible. Ideally there should be enough lighting to fill in the shadows. The most flexible results come from a movable desk light or spot. On their own, either of these will give hard lighting, but used in conjunction with other room lighting they can be helpful.

A wide range of lighting effects are therefore possible, from lighting from below to give the subject a sinister or powerful appearance to flattering diffuse light. In addition to daylight and room lighting, you may need to use white and



Clay Perry



Boutique A shop window provided the illumination for this striking study

Couple at a window Black and white film is better for a portrait in which the background is cluttered.

Old couple Using natural lighting from a window opposite, the photograph has caught a quiet moment when the couple display their family album

black reflectors. The classic 'Rembrandt look', for example, uses strong side lighting, perhaps achieved with the help of black reflectors on one side to kill reflections and the careful use of white reflectors to give a little light in the shadows. This sort of lighting brings out character and bone structure, but it emphasizes facial features, making them more angular. Someone with a hard, bony face will not be flattered by such lighting, whereas flat lighting, with the subject facing a window, will help to soften their features. Similarly, a person with full features will look better with side lighting than with flat lighting.

The background to the portrait can

also have a great influence on the mood of the picture. By changing the lighting you can emphasize or suppress the background, and by choosing the appropriate lens you can include varying amounts of background. Again, you must consider the sort of portrait you want. A head and shoulders, or head only, shot may suffer from a distracting background in which case a standard or medium telephoto lens is probably the best choice. On the other hand, an 'environmental' picture, which includes the subject's surroundings, is suited to a moderate wide angle lens, with the subject sufficiently far away to avoid undue distortion. When using a wide angle, remember to photograph your subject more or less face on, to avoid distortion.

Portraits which include a good deal of background detail in this way are an interesting alternative to the more usual head and shoulders portrait. They provide space for many of those clues,



Robin Laurance



Trevor Wood

which, like the lines of experience, tell us a great deal about a person's character and life style. With older people in particular, the accumulation of personal trifles, pictures and souvenirs, are an essential part of that person. At the other end of the age scale, a child's first drawings and paintings form a natural background to a portrait. You could even engage a child's attention by asking him or her to draw or paint or draw something while you take the photographs.

As well as looking for these visual clues, the indoor photographer must also be on the lookout for potential distractions when deciding on the way to approach the shot.



Paul Joyce

A. J. Ayer Harsh sidelighting with a reflector on the shadow side

Chinese Room lighting can often be quite adequate when using fast film

Pay special attention to the wallpaper—a strong pattern is likely to be very noticeable, particularly in black and white.

If the background or lighting in one room are unsuitable, then try other rooms to achieve the best results. Also look at what the subject is wearing. Dark clothing in light surroundings is difficult to photograph, and rather than make life difficult for yourself the best solution might be to ask your subject to change.

Remember, however, that few people actually like being photographed, and for your subject the experience is perhaps less thrilling than it is for you. It is vital to be prepared before you start—assemble a good collection of reflectors and sheets, if you think you will need them, together with a range of clips, clamps, sticky tape and so on to help set them up without fuss.

Your choice of film depends on the circumstances. Fast films will be particularly useful, being both sensitive and comparatively low contrast. In black and white, you are mainly concerned with the strength and direction of the light, but when using colour slide material you must also consider the colour of the light.



Richard and Sally Greenhill

As well as the problems of different colours of artificial light (see pages 682 to 685), there are such unknown variables as the colour of the walls, and shifts of the colour of daylight when the sun goes behind a cloud. Given all these, the best solution may simply be to use fast colour negative film, so that colour corrections can be made during printing.

Whether you use fast or slow film, a tripod can be very helpful. As well as allowing you to use exposure times slower than 1/60 second, it enables you to keep the camera fixed while you vary the set up. It may be hard to achieve a relaxed, natural look, however, so the choice depends on you, your subject and the effect you want.

George Eastman

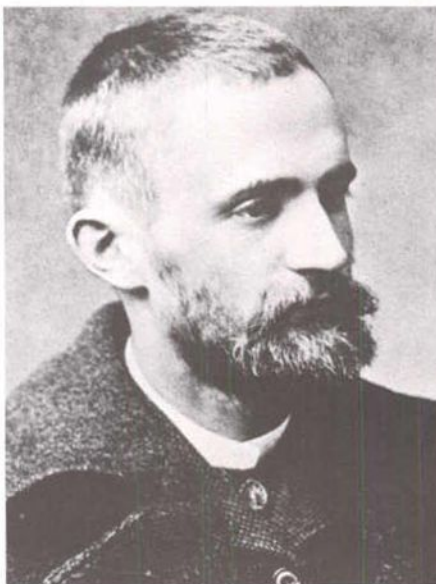


Simon de Courcy Wheeler/by courtesy of the Kodak Museum

The inventive genius of George Eastman, the founder of Kodak, revolutionized photography. By the beginning of the 20th century, using his small, easily operated cameras and roll film, anyone could take snapshots with a bare minimum of technical knowledge

During the early years of photography, many people contributed ingenious ideas and made tremendous advances in photographic technique. Many people also invested large sums of money and made their fortunes from the growing interest. But one man in particular stands out from all of them as the one who brought photography to the people—George Eastman, the originator of Kodak.

When George Eastman became interested in photography in the late 19th century, photographs were already extremely popular, but relatively few people were able to take them—only commercial photographers and a few wealthy or knowledgeable amateurs. By the time he died in 1932, many millions of people with little or no technical knowledge were taking photographs and the popularity of the camera was rising ever more rapidly. In 1878, when the Eastman company started up, taking a

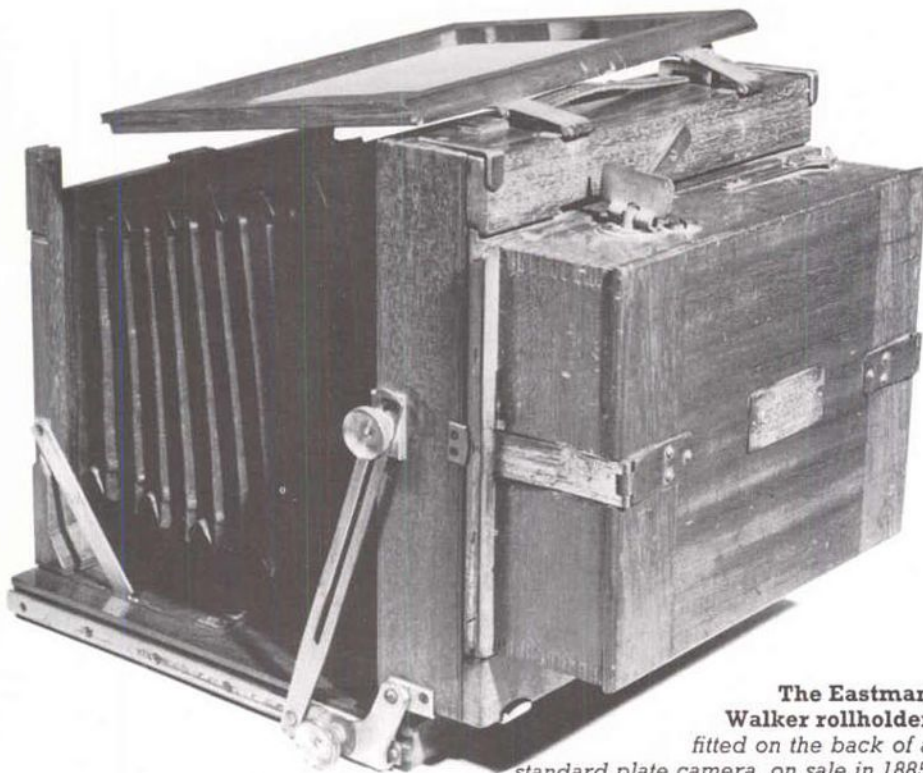


picture was a long and messy process. Each frame would often have to be individually prepared immediately before exposure—which could last many seconds—and developed very soon after, requiring the photographer to carry bulky equipment including chemicals and darkroom. By the turn of the century, picture taking was simply a matter of pressing the shutter for an exposure lasting a fraction of a second.

Born in 1854, of English descent, Eastman worked as a bookkeeper in the Rochester Savings Bank in New York State as a young man. He became interested in photography in 1877, and took lessons in wet collodion work from a local photographer. He was soon

George Eastman *The inventor of the snapshot and the creative genius behind Kodak, the most important company in photographic history*

By courtesy of the Kodak Museum, Harrow



The Eastman Walker rollholder
fitted on the back of a
standard plate camera, on sale in 1885

dissatisfied with the need to carry around 'a pack-horse load' of equipment and chemicals. In 1878 he read in *The British Journal of Photography* of the new, improved gelatin dry plate process invented by Dr R. L. Maddox in 1871 and perfected by 1878. This not only freed the photographer from carrying around

a portable darkroom to prepare the plates, but also made it possible to give 'instantaneous' exposures. The new process was very much faster than its predecessors, with exposures of a fraction of a second. This made it possible to hold the camera by hand and use action-stopping shutter speeds.

Eastman immediately tried out the new formula for himself and set to work to establish a manufacturing process. By the following summer, he had invented a machine to coat plates with the emulsion and went into commercial production in 1880. His plates soon acquired a reputation for quality.

While the new plates simplified photography, the heavy and fragile glass plates were awkward to carry around and Eastman looked for ways of replacing them. In 1884, with camera maker William H. Walker, Eastman devised a *rollholder*—an adaptor for the standard plate camera which took a roll of sensitive negative paper long enough for 24 or 48 exposures. The Eastman-Walker rollholder was marketed in 1885, with a new roll negative 'film', in which the emulsion could be stripped from the paper base after exposure and processing, and transferred to a transparent support.

The rollholder enjoyed some success, but the cumbersome cameras and messy chemicals put many potential photographers off. Eastman therefore launched a new camera in June 1888, designed specifically to take the effort out of photography and give it popular appeal. Conscious of the importance of a name, Eastman needed a name that was both distinctive and easy to pronounce in most languages. The name he decided on was 'Kodak'.

The Kodak was a small box-form camera, 90 mm high, 90 mm wide and

An American family at home Taken on a revised version of the first Kodak which produced circular exposures

The Kodak, 1888 Eastman's first camera shown here with the first commercial celluloid roll film. Portable and easy to operate, it was an instant success



All photographs courtesy of the Kodak Museum, Harrow



165 mm long, light and easy to hold. An integral rollholder carried enough paper film for 100 circular exposures 62 mm in diameter. There was no viewfinder, but V-shaped lines impressed into the camera top showed the field of view of the wide angle lens. The great depth of field of the lens made focusing unnecessary. Operation was simple: the shutter was cocked by pulling a cord and released by pressing a button. A key wound on the exposed film.

The most important part of Eastman's concept, however, was the follow-up to exposure. Reasoning that it was the processing which discouraged most people, Eastman's company offered a developing and printing service—a new idea at the time. The camera was bought ready loaded, and when 100 exposures had been made, it was posted back to Eastman's factory where a new film was inserted and the camera returned to the customer. The film was developed and printed and returned in about ten days. Eastman sold the camera with the slogan "You press the button, we do the rest."

Although roll film was a great improvement on plates, paper was not an entirely satisfactory material—primarily because it was not transparent. In 1888, John Carbutt, an English photographer working in America, persuaded a manufacturer to produce and sell clear sheets of cellulose which were coated with the sensitive gelatin emulsion. These were a little too thick for roll film, however, and in 1889 a man working for Eastman

The Brownie (above and below) was low priced and was the first camera that nearly everyone could afford to buy. It was an immediate success—over 100,000 were sold in the first year—and the Brownie and its many successors were to be the first cameras for many generations of photographers

EASTMAN KODAK CO.'S BROWNIE CAMERAS

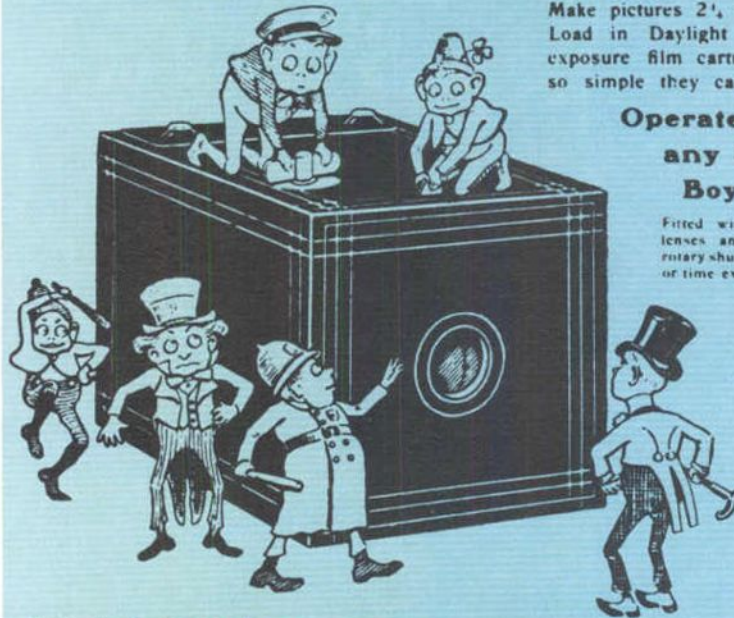
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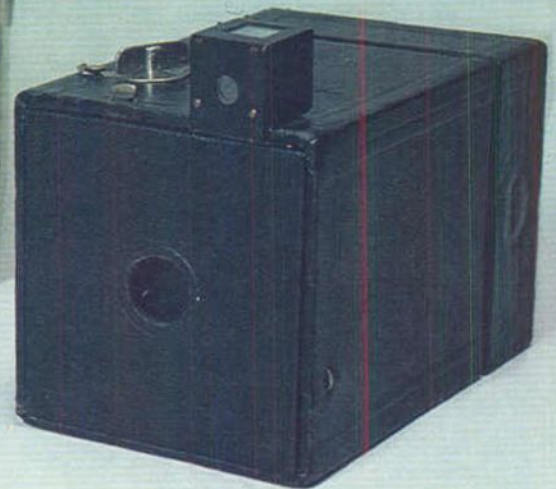
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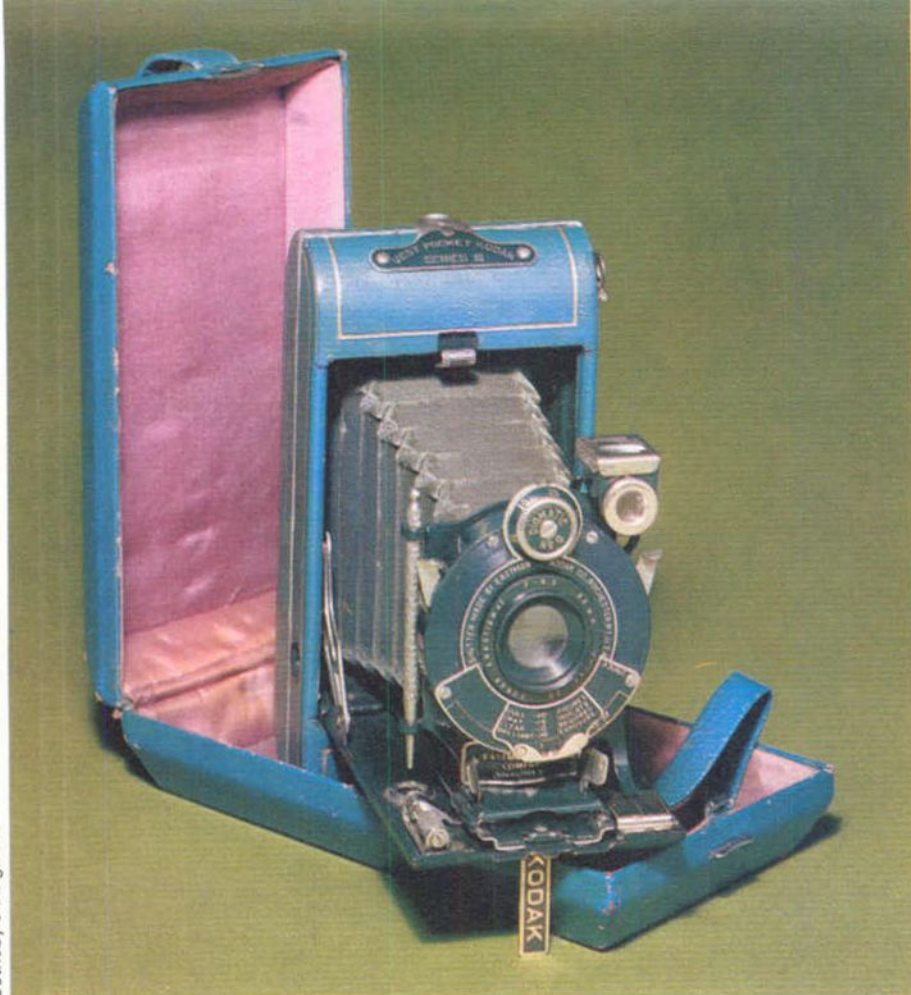
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patented a roll film made from thinner nitrocellulose. The Eastman company went into production immediately and cornered the market. Nitrocellulose roll films had in fact been invented independently in England two years earlier by the Rev. Hannibal Goodwin, but his patent was not granted until 1898. Nevertheless, after a law suit lasting 12 years, the Eastman company had to make a huge settlement in favour of the owners of Goodwin's patent, the Ansco company. By that time, however, Eastman had a virtual world monopoly of the roll film market.

The first Eastman cameras to use the new roll film were the Pocket Kodak camera and the Bullet camera, which introduced a range of roll film box cameras which were to last into modern times. In 1897 the small and pocketable Folding Pocket Kodak camera was marketed, introducing the 58 x 82 mm rollfilm negative format which remained popular for sixty years.

The need to load the camera in the dark was eliminated in 1895, when Eastman adopted an invention by Samuel Turner. The film was attached to a longer length of black paper and wound on a spool. The paper protected the film from light during loading and unloading, and exposure numbers printed in white on the back were visible through a red window in the back of the camera.

However, the biggest boost to the growth of snapshot photography came in 1900, when Eastman launched the Brownie camera. Aimed especially at

The Vest Pocket Kodak The Series III Diomatic, shown here, had an 83 mm lens and a separate lever to adjust the focus and the aperture

The 1914 Kodak Autographic The user could open a flap at the back of the camera and write information on to the film. It also had a built-in stand



children, the Brownie camera was a simple, small cardboard and wooden box camera, taking pictures 58 mm square. The name of the camera was taken from the characters created by the Canadian author and illustrator Palmer Cox, whose stories about the Brownies—little pixie-like creatures—were extremely popular with children in the 1890s. The camera had a V-shaped guide marked on the box, like the original Kodak camera, rather than a viewfinder—though a clip-on reflecting viewfinder was available as an optional extra for those who wanted it.

While the box camera was simple, reliable and cheap, it was relatively bulky. The Folding Pocket Kodak camera range was more compact when folded, but pockets needed to be rather large to contain them! A trend towards more 'pocketable' cameras began with Houghton's Ensignette of 1909, which measured only 100 mm x 50 mm x 20 mm when closed. While it was very popular, its success was eclipsed by that of the Vest Pocket Kodak camera introduced in 1912.

The VPK, as it was popularly known, used 127 roll film, and closed down to 120 mm x 60 mm x 25 mm. It opened out on lazy-tong struts, and took a negative 40 mm x 62 mm. It was exceptionally popular, and almost two million were sold between 1912 and 1926. Its small size made it especially popular with soldiers during the First World War.

In 1914, Eastman launched a new range of folding cameras incorporating an invention by Henry Gaisman. Lifting a flap on the back of the camera revealed the backing paper of a special roll film. The film was protected from the light by a layer of blackened tissue between the backing paper and the film. Pressure



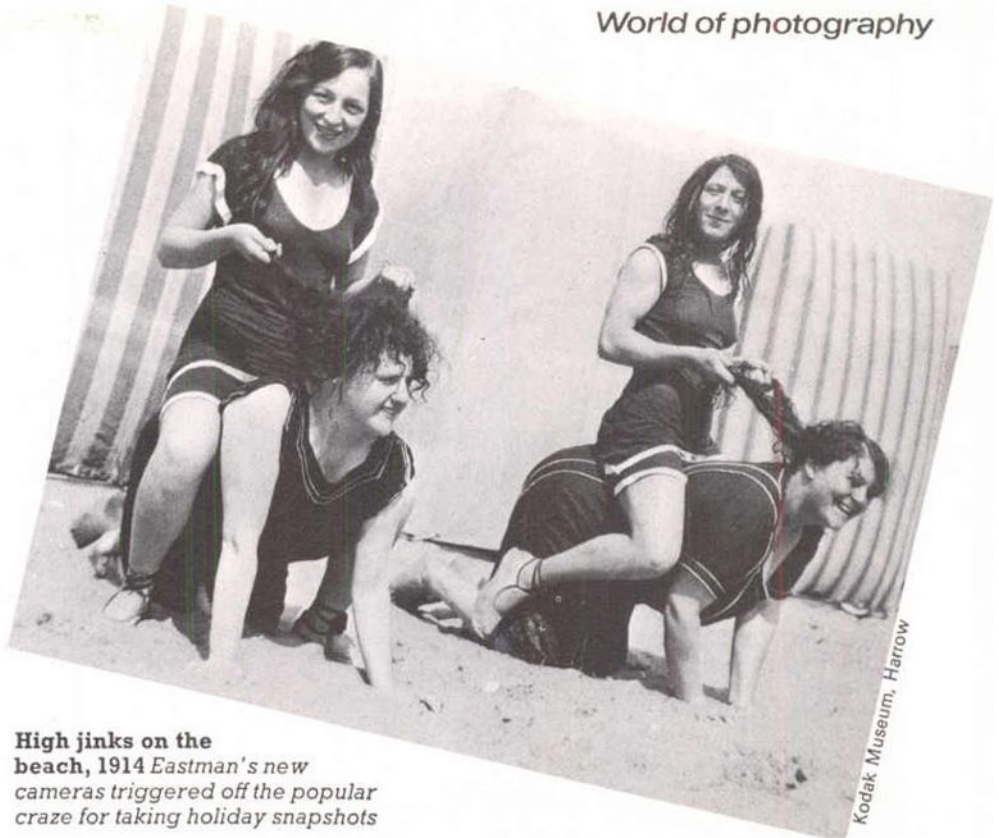
from a metal stylus, supplied with the camera, made the tissue transparent and exposed the film at that point. So by writing on the backing paper with the stylus you could record exposure details, dates and locations for each shot. When the film was developed, the writing was revealed on the film between the negatives.

This Autographic feature was fitted to most Kodak cameras until the 1930s, when more sensitive films made the system impractical. Several of the larger format Autographic Kodak cameras had a coupled rangefinder to simplify focusing—a remarkably advanced feature for the time.

By the 1920s, snapshot photography had become a feature of life for many families. Equipment had become relatively cheap, and sales increased. The 1920 sales of Kodak cameras alone were five times those of 1914. A feature of several box cameras in the 1920s was the provision of built-in close-up devices. The Ensign All-Distance camera (1927) had a lens which could be brought into position by pressing a lever.

In the late 1920s Eastman introduced a range of cameras in fashion colours. Breaking away from the traditional black, both box and folding cameras were decked in a range of as many as seven coloured coverings. Some of them, like the Vanity Kodak cameras, had special matching silk-lined cases. The most remarkable were the Beau Brownie cameras of 1930, styled by the leading American designer Walter Dorwin Teague with dramatic and stylish Art Deco designs.

The Beau Brownie, 1930 A specially designed range introduced to attract a new section of the camera buying public to photography



High jinks on the beach, 1914 Eastman's new cameras triggered off the popular craze for taking holiday snapshots

Kodak Museum, Harrow

In the same year, Eastman made an extraordinary gesture to mark the 50th anniversary of his company, now a huge international organization. He gave away over 500,000 Anniversary Hawkeye cameras, each distinguished by a gilt badge. He had, over the years, given away the greater part of his personal fortune to various charities, including the University of Rochester and the Massachusetts Institute of Technology, and had founded a series of Eastman Dental Clinics throughout the world. He had pioneered profit sharing, insurance and pension schemes for his employees.

In the 1920s, conscious that his sudden death might affect the fortunes of his company, he slowly withdrew from day to day control, finding time for the first time in his life for relaxation, including two safari trips to Africa. In 1932, in the grip of a painful terminal disease, Eastman cleared up his affairs, disposed of his remaining fortune and then took his life, leaving a note 'My work is done, why wait?' He had launched popular photography, and by the time of his death he and his organisation had brought this exciting medium within the reach of almost everyone.



Kodak Museum

Retouching prints

Print retouching is a valuable technique for repairing or restoring marked and damaged prints. With some practice, it can even be used for creative afterwork

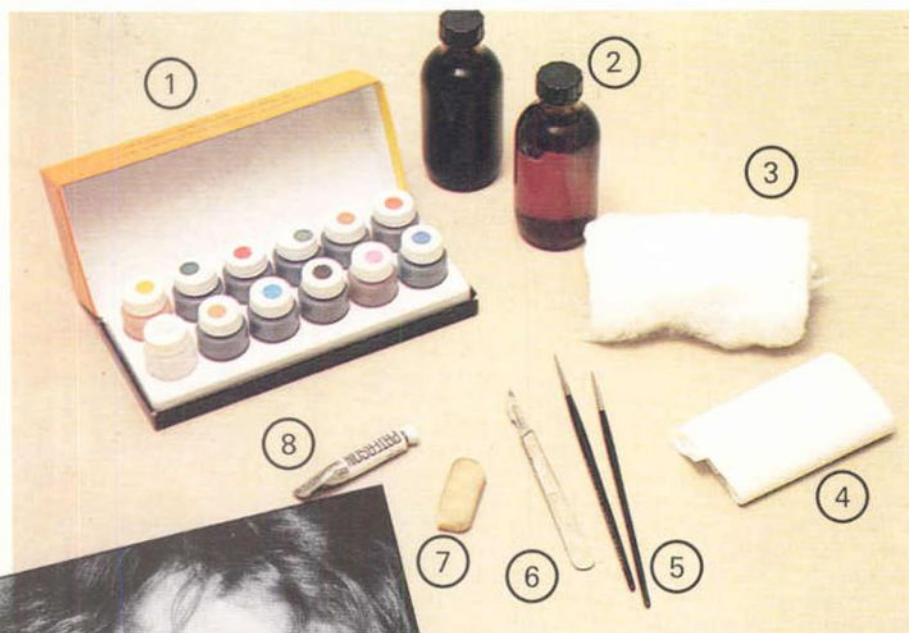
One of the most frustrating experiences that can happen to the photographer is to spend a great deal of time and effort making a print from a cherished photograph and then emerge from the dark room to find it has a small but unsightly blemish. If the print is to be shown only to friends, you may be prepared to accept it, but if the print is to be put on permanent display it has to be perfect.

Providing the negative is in good condition, you may be able to make the print again once you have identified and removed the cause of the blemish. But should the negative be at fault or should you wish to save the blemished print, the print must be retouched.

Retouching is, in many ways, a last resort and should be avoided if possible. Take meticulous care when handling negatives and prints to avoid finger prints and do your utmost to reduce dust. Store negatives properly to prevent scratches and make sure that films and prints dry evenly.

Whenever a print seems to need retouching, try to trace the cause of the blemish back to its source and take the necessary steps to prevent it happening again. Where the fault is on the negative, so your only chance of getting a good result is to make a print and retouch it, it is worth printing on fibre-based paper rather than resin-coated (RC) paper because it is much easier to retouch fibre paper. A matt paper is also preferable to a gloss since most retouching dyes dry to a matt finish, and may show up against a gloss surface. If you do want a gloss finish, you can add a little gum arabic or the gum from the sticky flap of an envelope to give the retouching dye a glossy finish.

The nature of retouching depends on the blemish. Some blemishes, in fact, can be removed very simply by washing the print again. Stains from ink or tea splashes, for instance, can often be removed by thorough washing and swabbing, particularly in the case of RC papers since the plastic protects the print. When swabbing RC papers be careful not to scratch the surface since this makes retouching difficult. Fibre-based papers, on the other hand, are less easily damaged but need to be dried carefully.



Retouching kit An inexpensive kit suitable for most retouching needs consists of: a selection of colour photographic dyes 1; reducer 2; cotton wool 3; tissue paper 4; a set of brushes 5; a scalpel 6; plastic rubber 7; and spotting paint 8

Knifing Instead of bleaching you may prefer to scrape away the emulsion layer where a blemish has occurred. Simply swab the print with water and use a scalpel to scrape the emulsion from its support base





Tapdance

When the blemish cannot be removed by washing, proper retouching techniques are needed. A dark blemish can be lightened with chemical reducers or removed with a knife. White marks can be darkened by 'spotting' with a pencil, paint or dyes.

Chemical reduction

Unwanted dark areas of the print can be lightened by careful application of a very weak solution of Farmer's reducer.

You can make up your own reducer by mixing 50 grams potassium ferricyanide with water to make 500 ml (Solution A), and 200 g sodium thiosulphate with water to make 100 ml (Solution B). For use, mix one part A, five parts B with between 10 and 30 parts water according to the strength of reducer required.

Although you can soak the print in reducer to lighten the entire picture, the normal approach is to apply the chemical only to the unwanted dark areas. Nevertheless, it is usually worth presoaking the print in water containing a little wetting agent. Keep another dish of clean water handy while applying the reducer to guard against mistakes.

If the dark blemish is fairly large, you can apply the reducer with cotton wool, carefully dabbing the affected area. For a small dark spot, apply the reducer with a fine hair brush. It should take a number of applications to significantly lighten the blemish: quick reduction indicates that the solution is too strong for even results and should be diluted with a sufficiently weak solution. Any reducer that smudges into the wrong areas can be removed by washing the print immediately in the dish of water.

Torn photograph The damaged original was first copied and then used for all retouching. Only faint traces of the tear joint remain

Spotting after knifing After knifing an RC print you may have to key the surface with white paint before spotting in the normal way to restore detail



Jon Bouchier

Combined images To record this rare screening of a historical film, the photographer had to make one exposure for the screen, and one for the crowd. The separate negatives were combined in printing and carefully retouched to disguise small overlaps

When the blemish is sufficiently light, wash the print thoroughly in clean water and dry normally.

Knifing

Small dark blemishes can be removed by careful scraping with a sharp knife.

But this is a very difficult technique and you should practise on waste photographs before you try your hand on a valuable print. Do not attempt to knife out anything but the smallest specks.

Use a scalpel with a very sharp fine point to gently scrape the blemish away with minute parallel strokes, barely touching the print with the point of the knife. Knifing on RC paper is made easier if you damp the print locally. Finish off by scraping another series of minute strokes at an angle to the first set.

After knifing out a dark spot you may need to paint over the area with white watercolour or *process white* paint, to provide a suitable key for the spotting stage which follows.

Spotting

Small light toned blemishes can be retouched by spotting with paint or dyes. Spotting may also provide a valuable alternative to chemical reduction and knifing of dark blemishes. Although there are alternatives, the best materials for spotting are watercolour paints in black, white and grey or specially designed



Tapdance



1 To spot a print, start by diluting a speck of spotting paint in a small amount of water



2 After choosing or mixing your colour, carefully dry the brush of excess paint by wiping it on tissue



3 Carefully apply the spotting medium, using a gentle stippling action, rather than painting strokes, to build up tones

Jon Bouchier

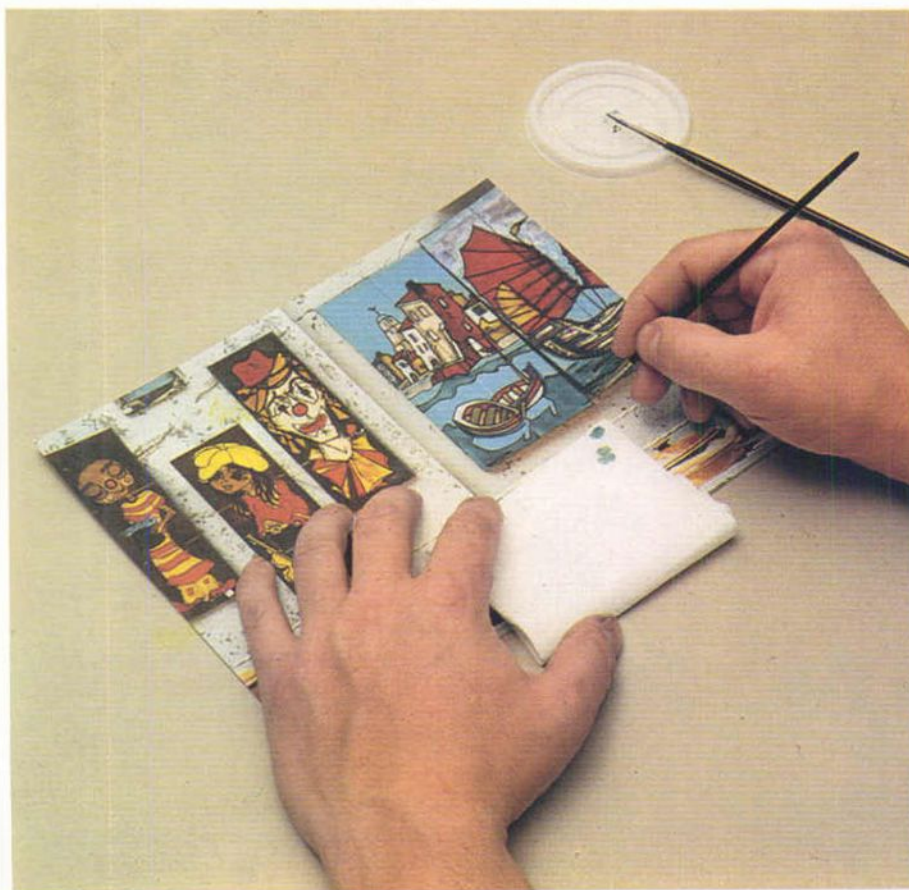
photographic dyes. These are applied with very fine brushes from sizes 00 to 3. If possible, use best quality sable brushes. Always keep them clean and protect them from damage by storing them in a box.

Blacks in a print can vary from brown to blue black, so the dyes or watercolours must be mixed to match the tone surrounding the blemish perfectly. Practise with different tone mixtures on waste prints until you are confident you can apply the correct tone to the print. Try to handle the print as little as possible since grease can prevent the paint from taking properly. Some professional retouchers recommend damping the print first to improve the way the print takes, but you will probably find it easier to work on a dry print.

To achieve the right tone, dilute the dye or paint and slowly build up the tone to match the print using a fairly dry brush. If the print is grainy, build the tone up by a stippling action. Be careful to apply very weak tones and build up gradually since it is very difficult to remove tone once it is on the print.

The best way to deal with large blemishes is to use a pressurized air-brush since the spray can be finely controlled and you can build up the tones layer by layer to achieve a graduated shading effect. The areas that are not to be toned must be covered with plastic masking film. When the mask is removed the edges must be

Spotting with colour dye Carefully dilute small quantities of dye and carefully mix—and test—the colours before attempting to spot a print



4 To bleach out detail, first prepare a small quantity of reducer. Then apply it carefully to the chosen spots

softened by hand retouching. This is a difficult technique and is explained fully in a subsequent article.

Retouching in colour

Colour prints can be retouched with dyes in much the same way as black and white prints, gradually building up the colour from yellow, cyan and magenta dyes until it matches the print. The dyes are available in kits and may be already made up into certain colours.

White flesh tone dyes need considerable dilution if they are not to appear brown. Leaf green is a useful subdued green for colouring foliage. Black can be altered by adding blue to give a cold black, or brown to give a warm black.



5 Carefully mop excess reducer before it has a chance to run, or over-bleaches. Otherwise rinse the whole print



6 You can modify whole areas by bleaching—here, repositioning a sunset—before washing and spotting

Before you begin to retouch, you must analyze the final colour very carefully so that you know roughly what proportion to mix the dyes. Try out various mixtures of dyes on an old, clean plate and a spare print with similar tones to the one you are retouching. Add a small amount of wetting agent to the dyes in order to keep the colour even.

Wherever the retouching needs a hard edge—with dust marks, for example—use a fine brush on a dry print. When retouching large, poorly defined areas, the print should be kept wet. Presoak it in water containing a little wetting agent and then swab it occasionally with damp cotton wool, taking care to keep the print completely flat on a sheet of glass or smooth plastic-topped table. The dampness keeps the edges of the retouching soft.

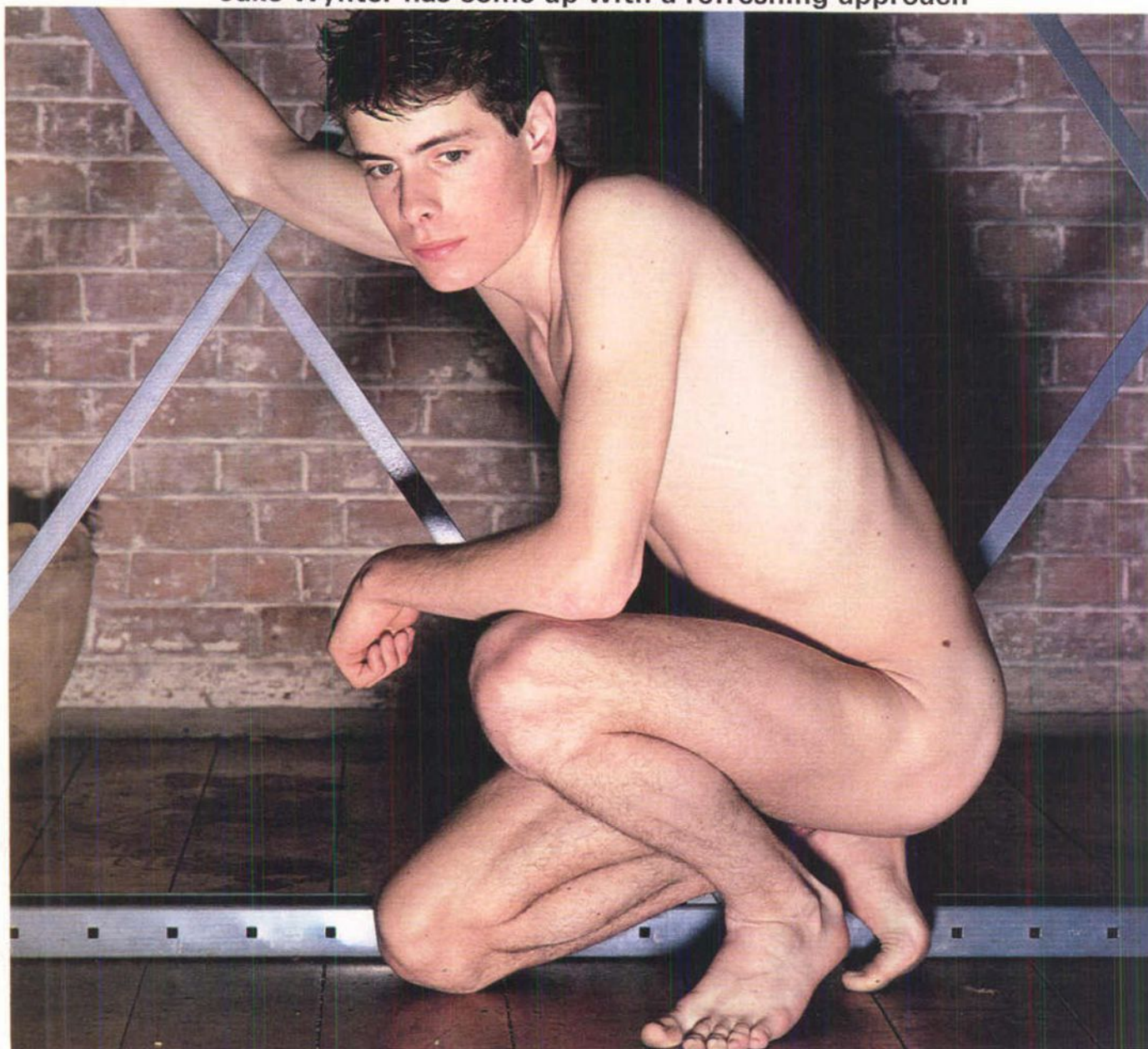
With colour prints, as with black and white pictures, you should be careful not to over-retouch. Too much retouching can look as bad, or worse, as too little.

Creative retouching

Once you master basic retouching techniques, you may begin to appreciate that they have far wider possibilities than simply disguising printing blemishes. They can be used creatively, for instance, for hiding unwanted detail—perhaps unsightly wrinkles in a portrait. Just a few examples are shown here. Further possibilities are explored in a subsequent article.

Male nude

Male photographers often shy away from photographing nude men. Jake Wynter has come up with a refreshing approach

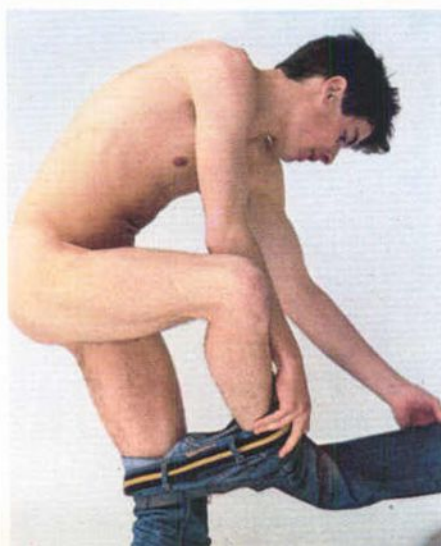


Jake Wynter

The male nude presents the photographer with all the problems usually associated with female nude photography. But since the field remains virtually unexplored, solutions are harder to find. The male nude images that do exist have tended to highlight a man's strength, speed or skill.

The photographer of the nude male form must be more aware than usual of what the photograph is trying to achieve. This should be reflected in the choice of pose and the mode of lighting.

Jake Wynter, who had never photographed the male nude before, decided to approach the assignment much as he would of done had the subject been



Flash Jake Wynter used his Hasselblad for this shot, obtaining the full benefit of the 6 × 6 cm format to draw out the detail in the subject. A 150 mm lens was used, with an 81 A filter adding warmth to the picture

Undressing Most of the photographs on this assignment were taken on Jake's 35 mm Nikon. Its versatility helped him convey a sense of movement while giving good quality results

Relaxing Jake's approach has produced a natural look which avoids either overt sexuality—the traditional approach—or coyness



Dual flash By positioning a unit on each side of the camera, and as close to the lens as possible, only a slight shadow is thrown on to the background

Boy and girl Overhead daylighting and a large foil reflector produced a soft, diffused lighting effect and minimized shadow. An 85 mm lens was used



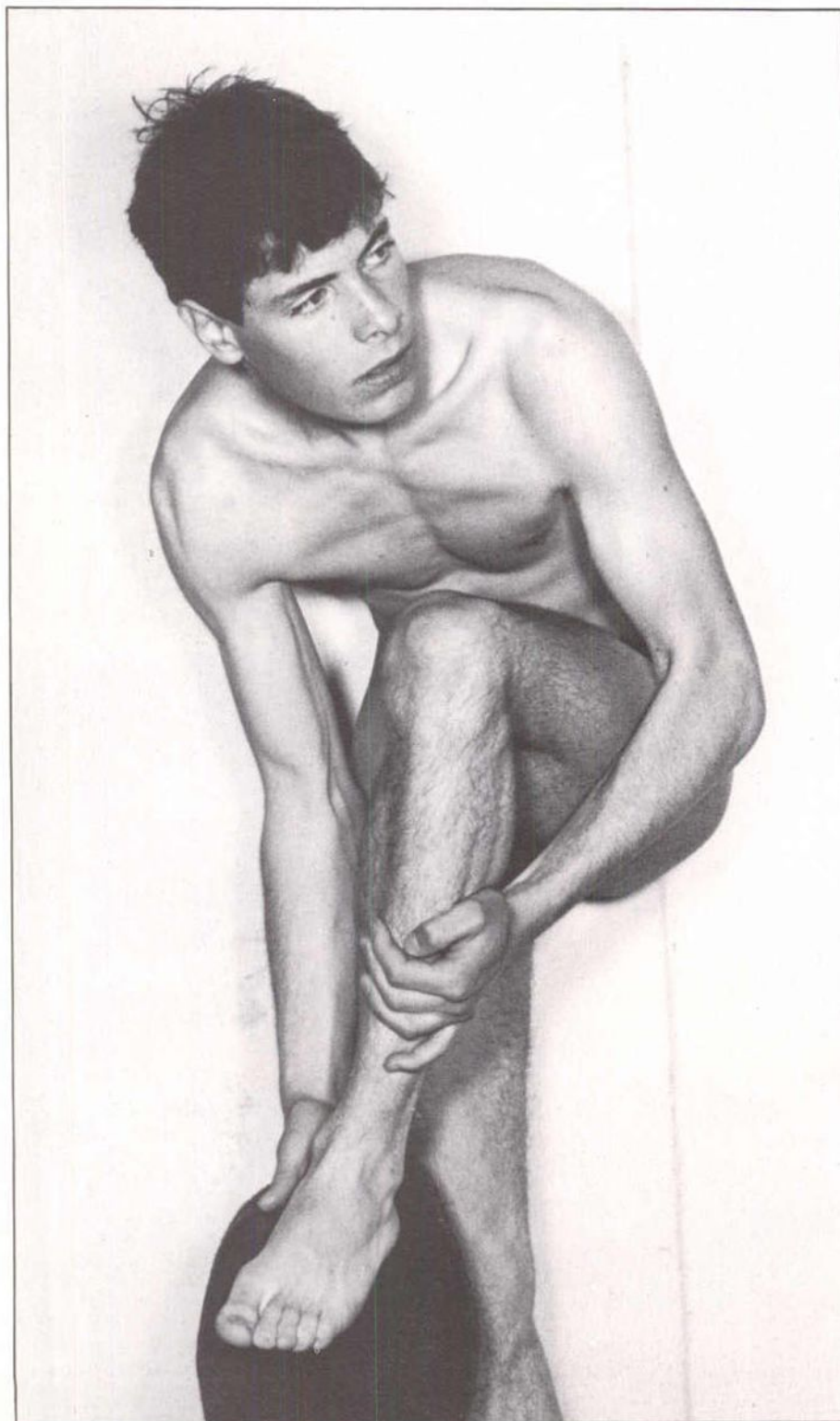
Assignment

female. Jake was determined to avoid the macho approach so often employed in male nude photography. He believed that the softer features of his model were unsuited to the sort of contrasty directional lights which are used to give a sculptural effect of the whole body.

'Posing the model', Jake agreed 'was the most difficult part of the whole assignment'. For most of the shots, he found it best to keep the model doing things—dressing or towelling himself off—so that a more spontaneous effect was achieved.

The first picture, taken on his Hasselblad, was a posed shot using flash. This was one of the few postures that Jake had actually decided upon before he began the assignment. He took a preliminary shot using a Polaroid back on the camera to check the exposure and the composition. Although the results of this experiment were not an encouraging as he had hoped, Jake remained confident that the shot was worth taking and pressed ahead.

The camera was about three metres from the subject and the flash head was



Drying off By employing the dual flash technique, Jake has successfully avoided the flat appearance often rendered by this type of lighting. In this shot taken through an 85 mm lens the model's skin has been given a soft, silky texture

Dressing The sweater adds a touch of colour to this shot without distracting the eye from the subject's main features

placed close to the camera. By positioning the model one metre from the wall, Jake achieved the pleasing shadow effect on the background.

Jake prefers simplicity in his photographic techniques. For his daylight shots he positioned a large board covered in wrinkled aluminium foil on the floor in front of the subject and angled it at about 45°. This resulted in the very soft diffused light.

The natural light, though, meant using the camera at shutter speeds of about 1/30 second so it was important to use a tripod and not to allow too much movement by the subject.

For the shot of the model alone on the bed, again taken using the board reflector, Jake deliberately chose a pastel colour for the bedspread so as to avoid any distracting effect.

It took about a dozen rolls of film before Jake was confident that he had achieved a satisfactory range of shots. The results are a welcome departure from the more stereotyped image of the male nude as the symbol of virile masculinity.

Jake Wynter



Creative approach

Movement

All too many photographs of moving subjects lose out because they are frozen, like statues, in their setting. But with a little thought, you can convey a sense of movement and give your pictures more impact



In the early days of photography, subjects had to remain still for an exposure of several minutes so that their image would be sharp in the picture. Reproductions of mid Victorian family portraits, in which the youngest child appears so frequently as a ghostly blur, show that it was quite difficult to 'hold it' for so long. Movement spoiled the picture.

Although photographers have been freed from the restrictions imposed by the 'hold it' approach, many people

still almost automatically freeze in front of a camera and do not expect it to be able to cope with movement at all. In fact the opposite is true. The camera can not only capture motion extraordinarily well, but can emphasize and exploit it, and even give the appearance of motion when none is actually there.

There are few things in the world that are really still. Some situations are full of action, while in others movement is more subtle. You can suggest movement

Horses A fast shutter speed captured the speed and excitement of this race. Even the ice is caught in mid air

of any kind in a still photograph by using three basic techniques—freezing the action, blurring the image or using a sequence to show movement patterns.

Freezing a moment in time is one of the most remarkable abilities of the camera. It is probably the most dramatic way of conveying movement, making

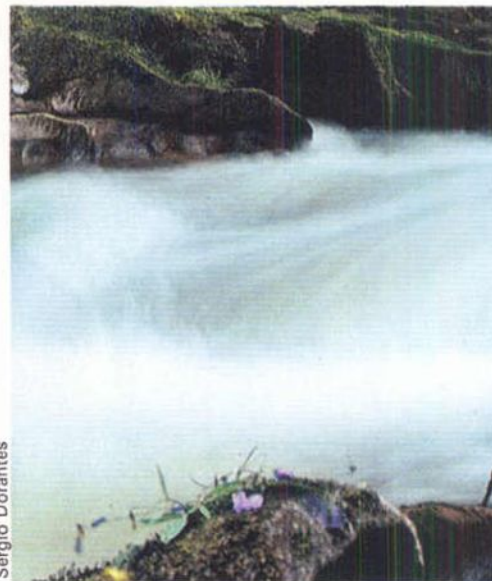
Leo Mason



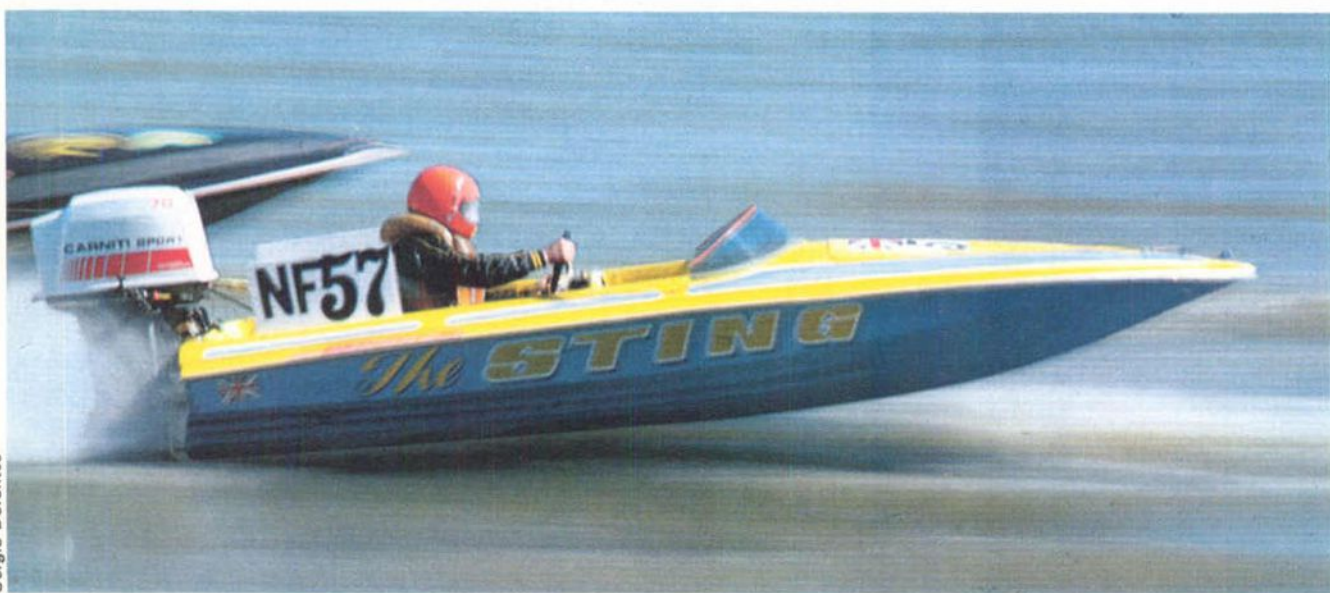
Tibor Hirsch/Susan Griggs Agency



Sergio Dorantes

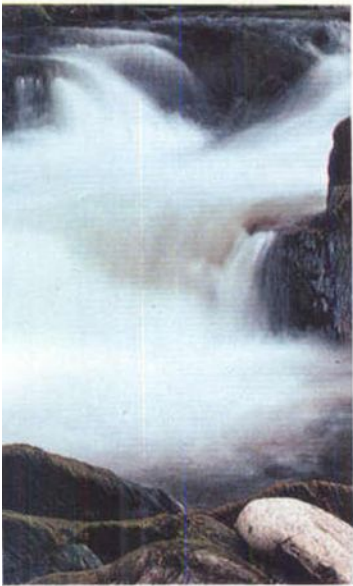


Sergio Dorantes





Adam Woolfitt/Susan Griggs Agency



Tennis player The shutter speed was just fast enough to render the face sharply, while the action of the serve is conveyed by a blur. **Speedboat** Panning carefully with the action keeps the subject sharp while the streaked background gives an impression of speed.

Horse The animal was static—only the camera was moved. **River** A slow shutter speed gives a blurred, silky flow instead of the frozen image which would result from a faster speed.

Bird Taken with a shutter speed fast enough to freeze the body of the bird, but not the wings, giving an idea of the movement in flight.

High jump With quick reflexes, you can catch the peak of the action



V. Pascal/Explorer/Vision International

Cricket Electronic flash is the most successful way of capturing the rapid movement of a small insect, like this flying cricket

every detail sharp and clear, giving a glimpse of what the eye cannot normally come to terms with.

Technically, freezing movement, whether that of a swing in a children's playground, or a bird in flight, depends on the rate at which the subject is moving, and the shutter speed. One of the simplest ways of stopping movement is to catch the action at its peak, at the point which it seems to be in motion, but is actually still, even though it may be only for a second or so. This can be achieved with the simplest of equipment. A child at the high point on a swing or seesaw, for instance, is at the peak of the action. The seesaw or swing has moved as far as it can in one direction, and stops for a brief moment before continuing in the other direction.

Train yourself to watch the movement you wish to record, and try to anticipate that brief moment when the action is at its height. To capture the moment perfectly, you must press the shutter just slightly before the peak of action. Since the action has stopped, you do not need to use the fastest shutter speed on your camera.

Generally, though, a frozen image lacks a sensation of movement. It gives a well defined view of a subject, but its very clarity obscures the impression of a moving object—simply because we do not see it so clearly in reality. To simulate a feeling of action, therefore, many photographers deliberately blur pictures by using slow shutter speeds, simulating the way the eye sees rapidly moving objects, such as a spinning aeroplane propeller, as a blur.

Try using slow shutter speeds to blur many different types of action, from a child speeding past on roller skates to the movement of waves on the seashore. As long as the subject is still recognizable, this can be one of the best ways to convey a feeling of movement.

Before photographing a moving subject, it is sometimes a good idea to decide what sort of movement it has. A smooth movement, such as that of a

train or car, may tolerate only a little blurring before it becomes unrecognizable. On the other hand, swirling or rhythmic movements may produce a complex variety of curves. These can be very striking with comparatively long exposures.

Between the two extremes of fast shutter speeds to freeze movement and slow speeds to introduce blurring is another approach. This is panning—following a moving subject with the camera, keeping its image centred in the frame. If you move the camera carefully and smoothly with the action there should be no blurring of the subject.

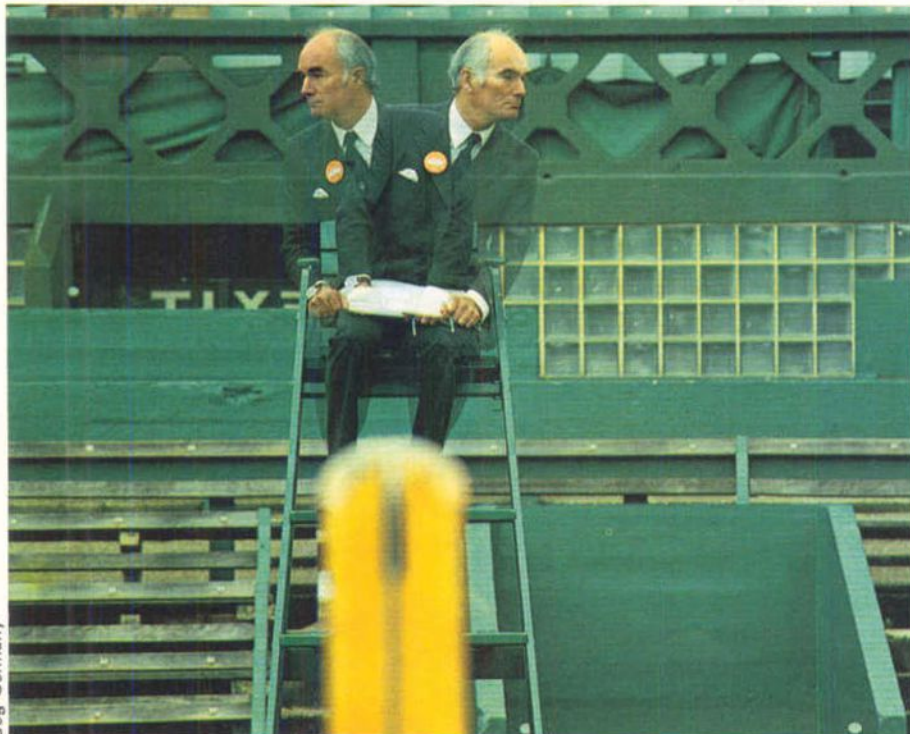
In the case of smooth motion, such as that of a racing car or a skier, a relatively slow shutter speed can be used to preserve a sharp image, with the background streaking. In this case, there are two advantages—the blurring of detail in the background helps the moving subject to stand out, and the streaks emphasize the motion and its direction. It is best to use a shutter speed that is only just fast enough to hold the main subject sharply, say 1/60 second. In one sense panning is a motion stopping device, as is a high shutter speed, but it differs in that it gives a sense of movement at the same time as a clear image.

Umpire A slow shutter speed shows the only movement made by the tennis umpire—an amusing effect.

Sandcastle A sequence clearly shows the movement of the tide as it threatens to engulf the sandcastle



Mik Dakin/Bruce Coleman Ltd



Geg Germany



Red Arrows *It is always worth waiting for the exact moment when the action peaks, as in this picture where the planes form a pattern as they separate*

action. This technique, more than any of the others, is an analysis of movement, dividing an event into separate components. Sequence photographs, taken in rapid succession, can be made with almost any camera, even simple ones.

While a motor drive is one way of providing a sequence of shots over a short period of time, sequences taken over a much longer period can show changes which are too slow to be noticeable. Such a sequence can be revealing about the nature of motion and change as the high speed frozen photograph.

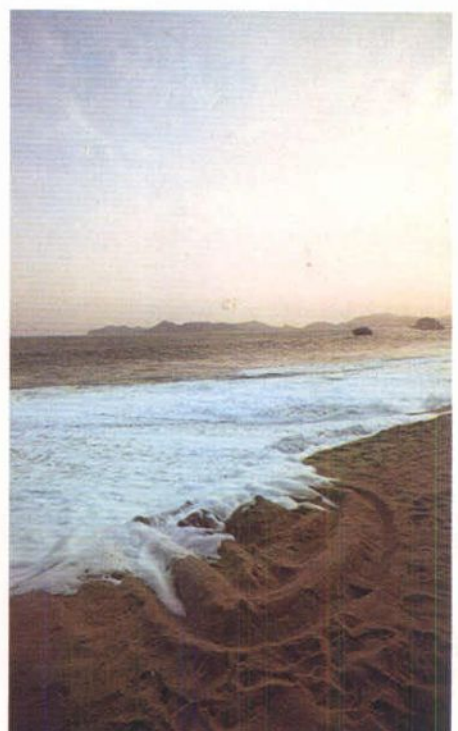
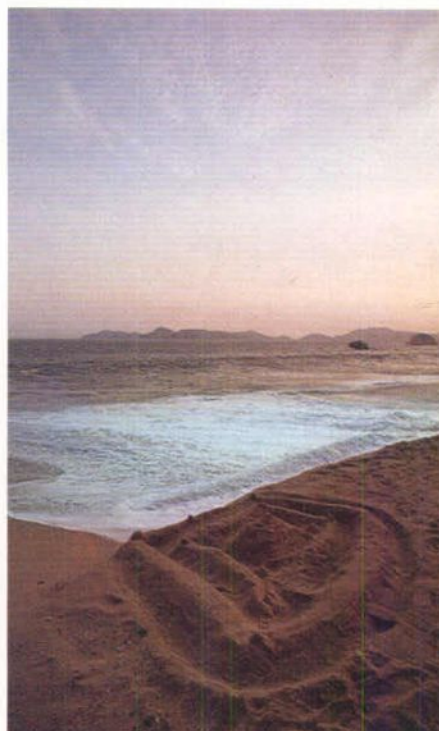
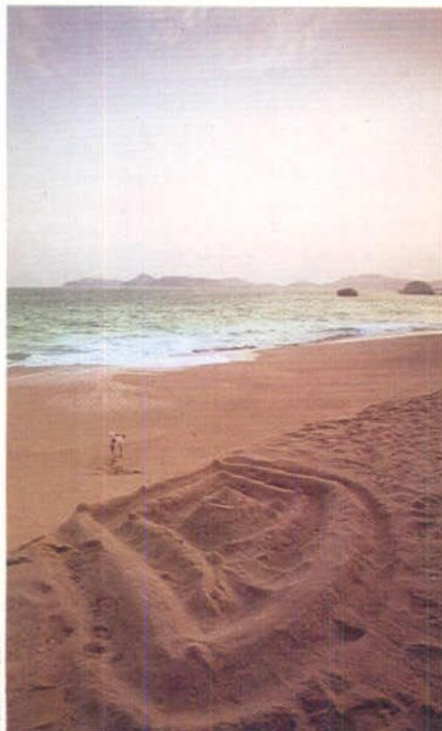
For a sequence of really fast action, however, a motor drive, or stroboscopic flash can be useful pieces of equipment. The stroboscopic flash, developed during the 1930s by Harold Edgerton (see pages 514 to 516), is normally used in a darkened room, with the camera's shutter left open. As the action starts, the strobe light fires a burst of flashes, normally at the rate of about 20 per second. Stroboscopic discotheque lighting works on the same principle, and the result is that in one frame, all the steps of the action appear neatly divided. As with any multiple exposure, it is most effective with a light subject and dark background. Try to use it at first with simple actions.

Whether you are using a fast shutter speed, relying on flash, or trying out the effects of panning or blurring the action, the real skill in photographing movement is in the timing of the shot. The term 'decisive moment' coined by Henri Cartier-Bresson is nowhere more relevant than in pictures of movement.

Moving the camera need not be restricted to panning, and can easily be used to introduce movement falsely into the scene. This is not the same as panning because you, as the photographer, have deliberately added the movement. A similar approach is to use a zoom lens, operating the zoom control during a slow exposure to add converging streaks. Used from directly in front of a stationary car, for instance, it can

give a reasonable imitation of real movement. On the other hand you can use it while panning—standing at the edge of a cycle track, for example, during a race—and the effect would turn out to be more impressionistic.

A quite different approach to movement is to use a series of images, either in the same print or film, or by arranging several photographs in a strip in sequence, to tell the story behind the



Robin Bath

the focusing screen. This action is referred to as *rising front*. The lens can also be moved downwards to include the base of the subject or more of the foreground.

Moving the lens sideways—a movement known as *crossfront*—means that a picture can be taken from a viewpoint slightly to one side of the subject. This is particularly useful when photographing highly reflective subjects such as a room containing mirrors, because it enables the photographer to avoid reflections of camera and tripod.

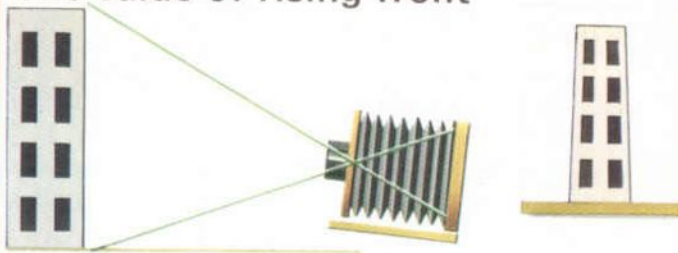
Swinging movements

While the lens is moved parallel to the film, to frame different areas of the subject, the angle of both front and back standards can be changed to ensure that near and distant parts of the subject are in focus even at wide apertures.

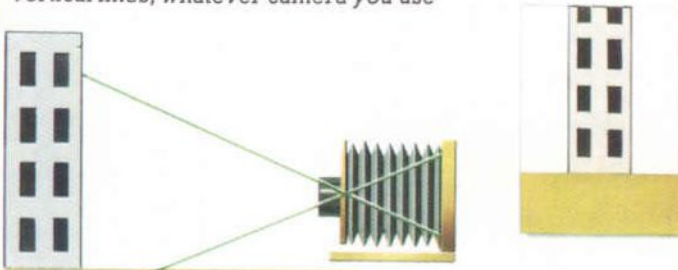
When the lens and film standards are parallel, as they are in small format cameras, the zone of sharp focus forms a flat plane, parallel to the surface of the film. This is fine when the subject of the picture is also a flat plane, parallel to the film, like a painting hanging on a wall, but if the subject lies at an angle to the camera, it is less convenient.

Using the swinging movements of a sheet film camera, the front standard can be swung forward so that the top of the focusing screen or film is focused on a closer point than the bottom, and the

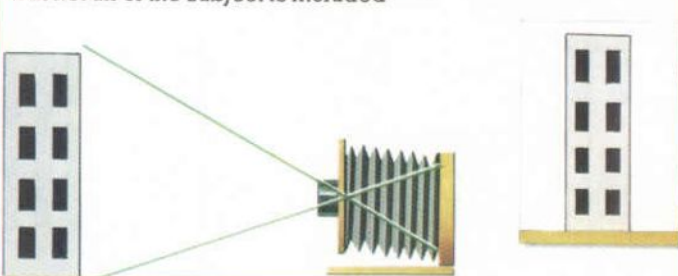
The value of rising front



Tilting the camera results in an image with converging vertical lines, whatever camera you use



Keeping the camera level Vertical lines are kept parallel, but not all of the subject is included



Rising front Only a view camera, or perspective control lens, can include all the subject, with perfect verticals

plane of sharp focus no longer lies parallel to the film, but instead lies at an oblique angle to it.

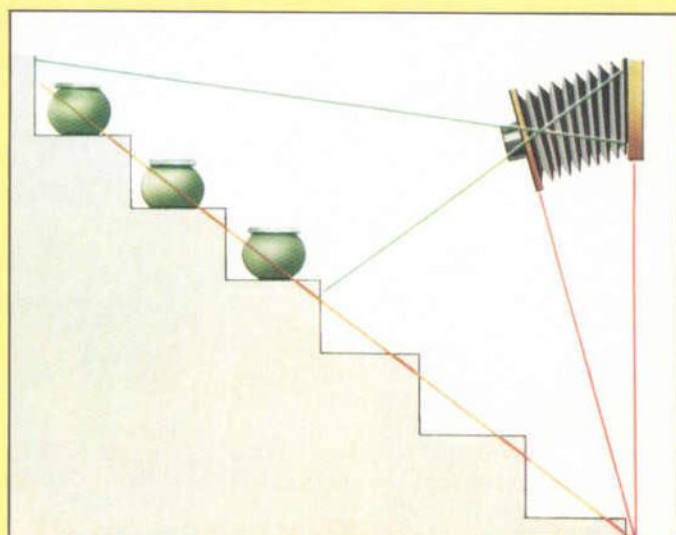
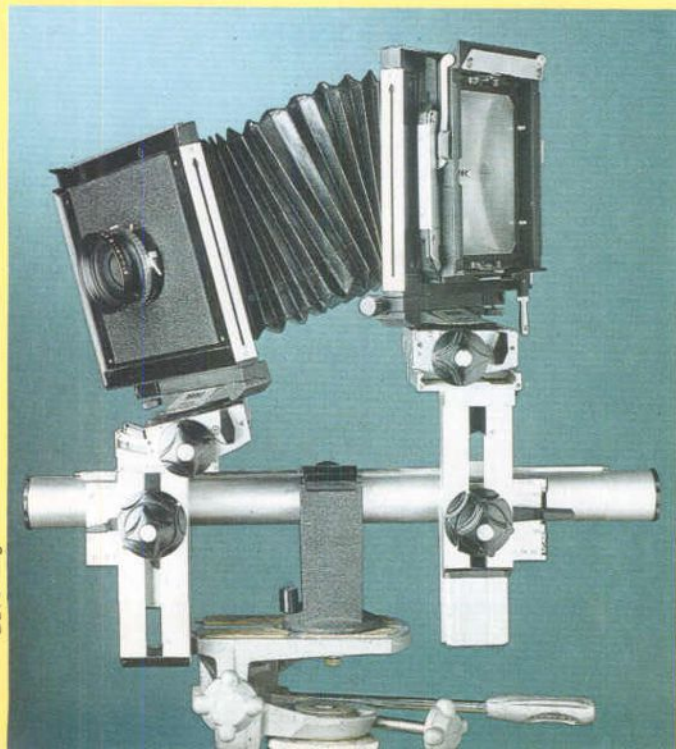
By careful adjustment of the angles of the camera back and front, it is possible to take a picture in which details

only a few centimetres from the camera and many metres away, are in focus, even at full aperture.

The position of the plane of sharp focus depends on the precise angles of the camera and lens standards. The best focus is obtained when lines drawn through the lens standard, the film standard and the subject plane all meet at the same point. This is called the *Scheimpflug relationship*.

Combinations

Camera movements can be used in a variety of other ways. Both swinging movements and rise and cross front can be combined, for instance, to change the apparent perspective of the subject or to deliberately distort its shape. Swing is also combined with rising front to ensure that the corners of the image are not cut off when the lens is raised almost to the limit of its covering power (see page 307). Of course, combined movements are complicated to carry out, and constant checks on the focusing screen are needed to ensure that all parts of the subject are in focus, and in the right place. This may be very difficult when the lens is stopped down to the working aperture—often $f/45$ or $f/64$ —because the focusing screen goes so dark that it is practically impossible to see the image. Many photographers using sheet film cameras will therefore use instant film in a special holder to check depth of field.



The Scheimpflug relationship When the lens, film and subject planes meet at a common point, all of the subject will be in perfect focus

Improve your technique

Mirror lens techniques

Despite their obvious physical differences, mirror lenses and refracting telephotos have a common function. But when should you use a mirror lens rather than a telephoto and how do you get the best from it?



Ed Buziak

Pictures taken with super telephoto lenses always look impressive—perspective is flattened, and distant scenery is dramatically enlarged. But most people are put off by the size and weight of the lenses—the longer ones are virtually impossible to hand hold, and few lenses longer than 300 mm will fit into the average camera bag.

Mirror lenses have overcome these problems of size and weight. By folding the optical path of the light entering the lens, so that it travels three times along the barrel, it is possible to cut down bulk and mass to a small fraction of that of a conventional lens.

Mirror, or *catadioptric*, lenses are not new—they have been around since the earliest days of photography, and the first portrait was taken using a lens that

reflected light, instead of refracting it. For a long time, though, problems of design and construction made the commercial use of mirror lenses impractical and until recently they were a costly novelty. This has changed, and mass production has brought the cost of mirror lenses down to a level comparable with ordinary telephoto lenses.

Mirror lenses are no longer confined to the upper reaches of the focal length range, either. Focal lengths as short as 250 mm and 300 mm are available, though 500 mm 'cat' lenses are more common. At the other end of the scale, there are 2000 mm mirror lenses in routine production, and longer focal lengths can be made up to order—though these are really astronomical telescopes adapted for use as a camera lens.

Jump for joy Mirror lenses form ring-shaped highlights on out of focus parts of the subject

Reflector or refractor?

There are a number of important differences between mirror lenses and conventional refracting lenses, and these differences affect the way that mirror lenses are used.

In a conventional lens, an iris diaphragm is fitted to control the width of the beam of light which enters the lens. It is impractical to fit an iris diaphragm to a mirror lens, however, because of the large diameter and optical construction, with a central obstruction. Reducing the aperture would seriously degrade performance. All the mirror lenses which are commonly available therefore have a

fixed aperture. This makes exposure control more difficult, and the light falling on the film has to be controlled by the shutter in the camera, or by inserting neutral density (grey-black) filters into the light path.

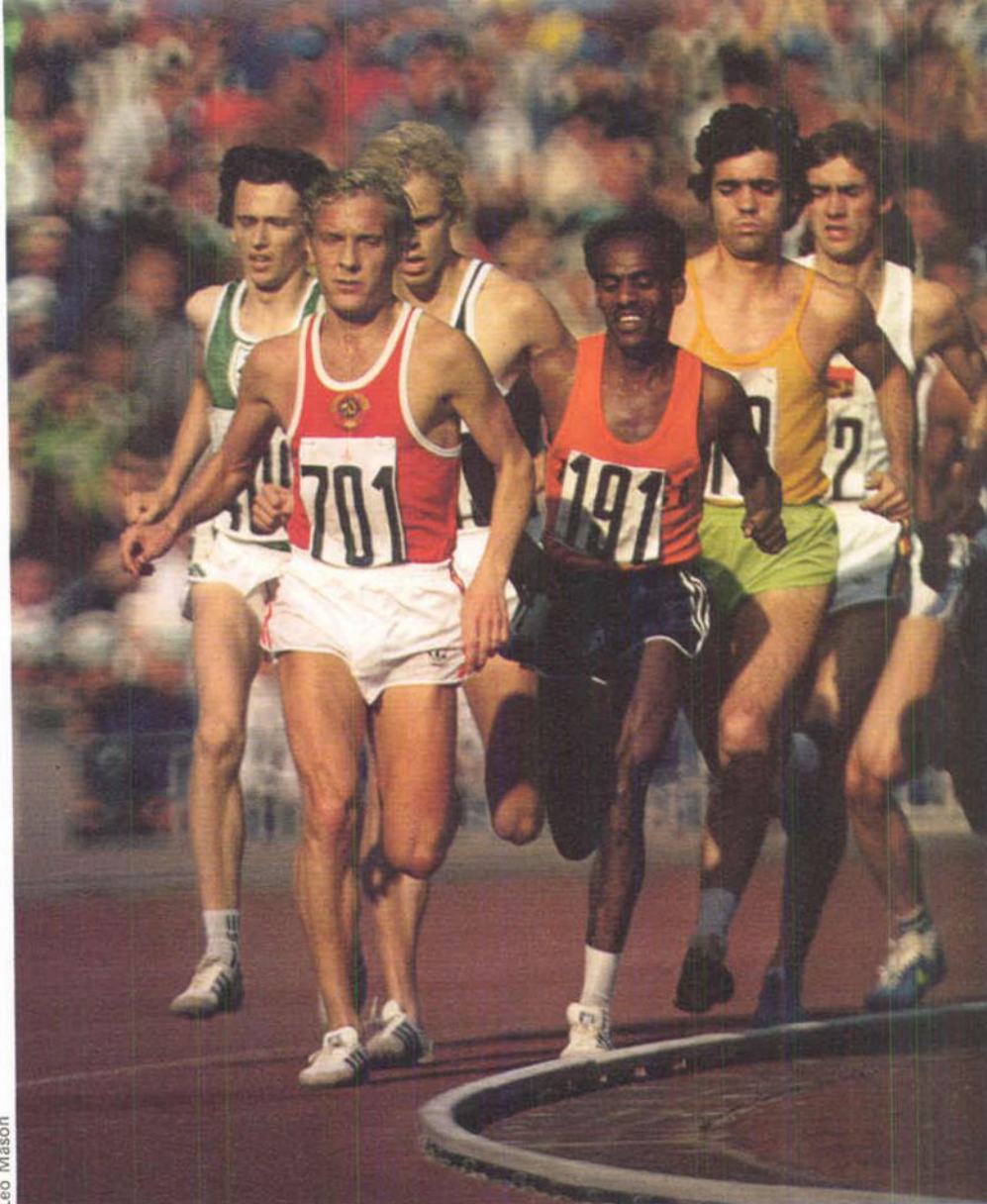
A second, equally important, consequence of the lack of diaphragm is that the photographer has no control over depth of field—the lens must be used at full aperture, and depth of field is always very limited.

The image formed by a mirror lens is reflected twice—once by the main mirror, and then again by a smaller mirror attached to the inside of the glass corrector plate at the front of the lens. This smaller mirror obscures the central portion of the lens, so the beam of light that reaches the film is not circular in cross section, but doughnut shaped. Though this does not affect the image when it is in focus, it causes out of focus spots of light to form circles instead of discs. This can make out of focus subjects look peculiar, particularly if they have very bright highlights. A few photographers avoid mirror lenses for this reason but most people find these doughnut shaped circles attractive, and use them for creative effect.

Against these drawbacks must be considered the enormous savings in weight and size that stem from the use of a reflecting lens design. Typically, a mirror lens is half the weight and a third of the length of a comparable refracting lens. 300 mm mirror lenses are often no longer than a standard 50 mm lens.

Mirror lenses in use

Because they have a long focal length and narrow angle of view, mirror lenses have similar limitations to conventional long telephotos (see page 585). They



Leo Mason

In the lead Because they can only be used at full aperture, mirror lenses have very little depth of field

Small wonders These lenses—300 mm, 500 mm and 1000 mm—are only a third the length of their refracting counterparts

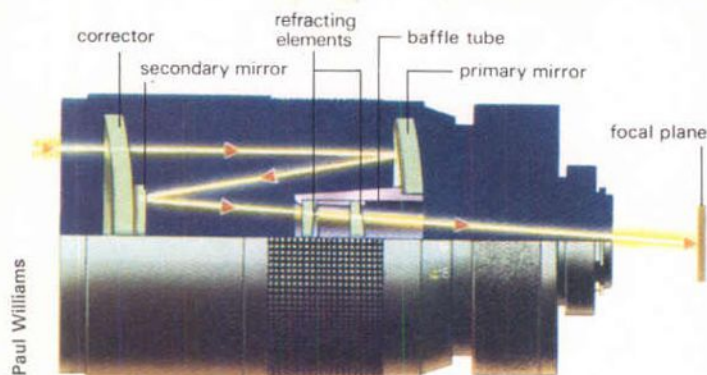
are prone to vibration and camera shake, so it is best to use some kind of camera support such as a tripod or monopod. The shorter focal length mirror lenses have no tripod socket of their own, since they are quite small and light, but those over 500 mm generally have a standard $\frac{1}{4}$ inch threaded tripod bush.

An ordinary medium weight tripod is quite adequate for 500 mm and shorter models. For a 1000 mm lens, a heavy duty tripod is needed to eliminate vibration, and the monstrous 2000 mm mirror lens that is sometimes used by professional photographers needs a special cast alloy mounting cradle, similar to a telescope mounting. This is used on a special plinth—an ordinary tripod is more or less useless.

Mirror lenses offer less wind resistance, and are better balanced than conventional telephotos. If you do not

Simon de Courcy Wheeler/lenses courtesy of Ohnar and Nikon





want to be encumbered by a tripod, you may find that it is possible to hand-hold a mirror lens at the higher shutter speeds. 250 mm, 300 mm and 500 mm lenses give acceptable results at 1/500 second or faster, but as a general rule, it is best to use the fastest speed possible. Remember that the pictures from any long lens will seem sharper if you use a tripod.

Focusing a mirror lens is not as easy as focusing a standard or short telephoto lens. The small aperture—usually $f/8$ or smaller—causes the microprisms and rangefinder wedges on standard focusing screens to black out. The solution is to use the plain ground glass portion of the focusing screen, or if your camera accepts interchangeable screens, to fit a different one. Screens are available which have plain matt glass all over, or which have focusing aids with prism angles more suitable for slow lenses (see page 724).

Mirror lenses have two unique features that affect focusing. First, there must always be a filter in the path of the light if the lens uses rear mounted filters. Although some mirror lenses accept filters on the front, many of them have a huge front element, and filters would be very costly. If it is fitted behind the lens, the filter becomes an integral part of the camera's optical system, and if it is removed, the resulting pictures will not be as sharp. Even if you do not need a neutral density filter for exposure control, you should use the UV filter supplied with the lens.

The second feature that you will notice is that mirror lenses have a focusing scale that carries on turning when you get to the infinity marking. This is because they are particularly susceptible to temperature changes, and the exact position of infinity focus varies according to the ambient temperature. When focusing on distant subjects, therefore, it is not sufficient to turn the lens until it stops, as this could lead to incorrect focus, particularly in cold weather. The focusing scale is a guide only, and should not be relied

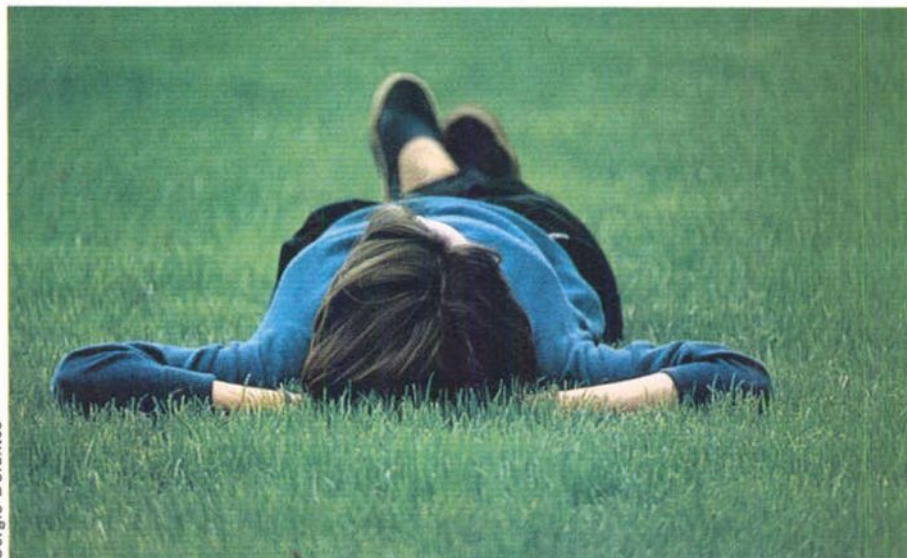
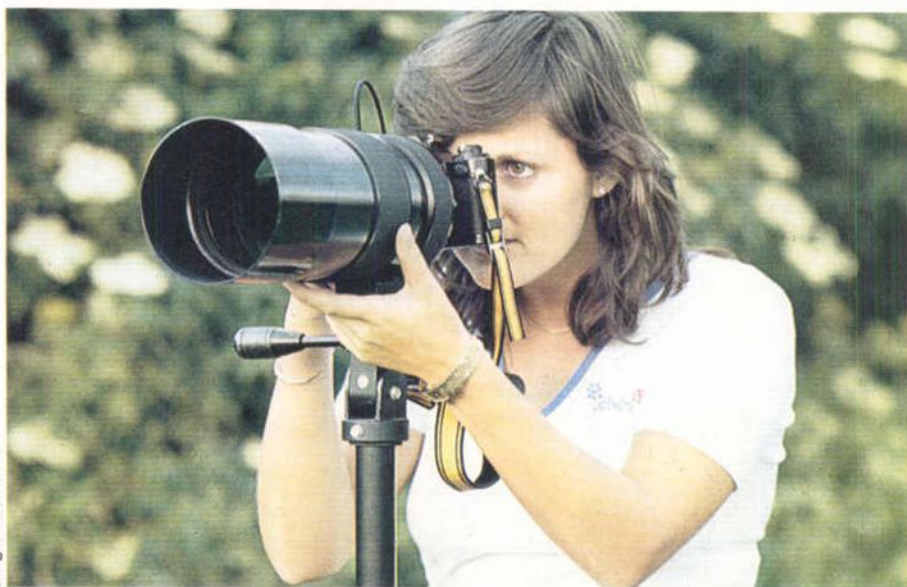
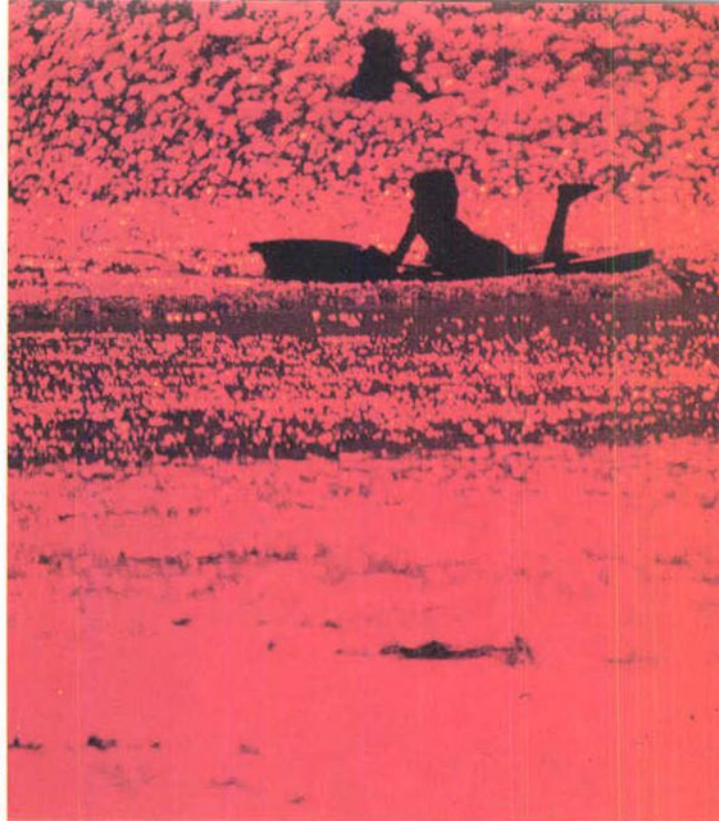
On a tripod For the longer mirror lenses—such as this 1000 mm—a tripod is absolutely essential

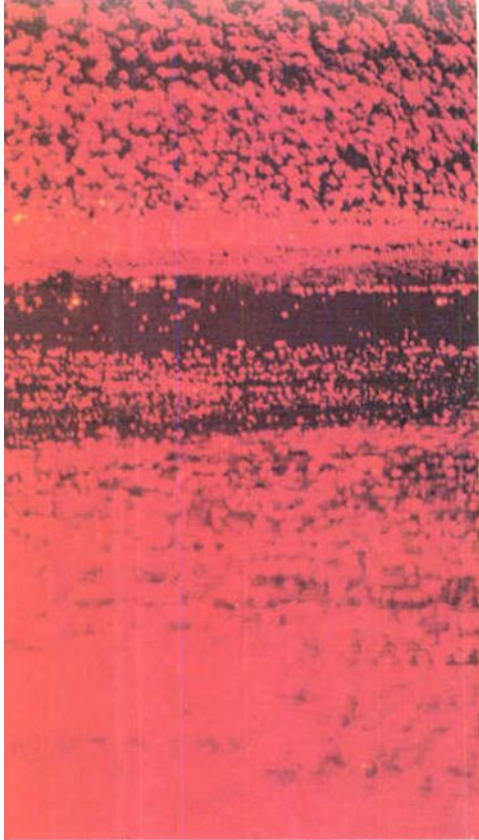
Dark corners All mirror lenses give slightly uneven illumination—this shows up as a central 'hot spot'

Curved mirrors
Two reflections of the image take place in the barrel of a mirror lens

Red raft The red filter that is built into some mirror lenses may give striking results with colour film

Ed Buziak





upon for accurate results.

Some of the newer mirror lenses have a close focusing facility which enables the frame to be filled by a small subject, and with a 2× teleconverter, macro pictures are possible at a distance of a couple of metres. While this is a handy feature for occasional close up photographs of flat subjects, the shallow depth of field of mirror lenses limits their usefulness at close range. Another consideration is that they give their best results when focused on infinity, and performance is not as good at short subject distances.

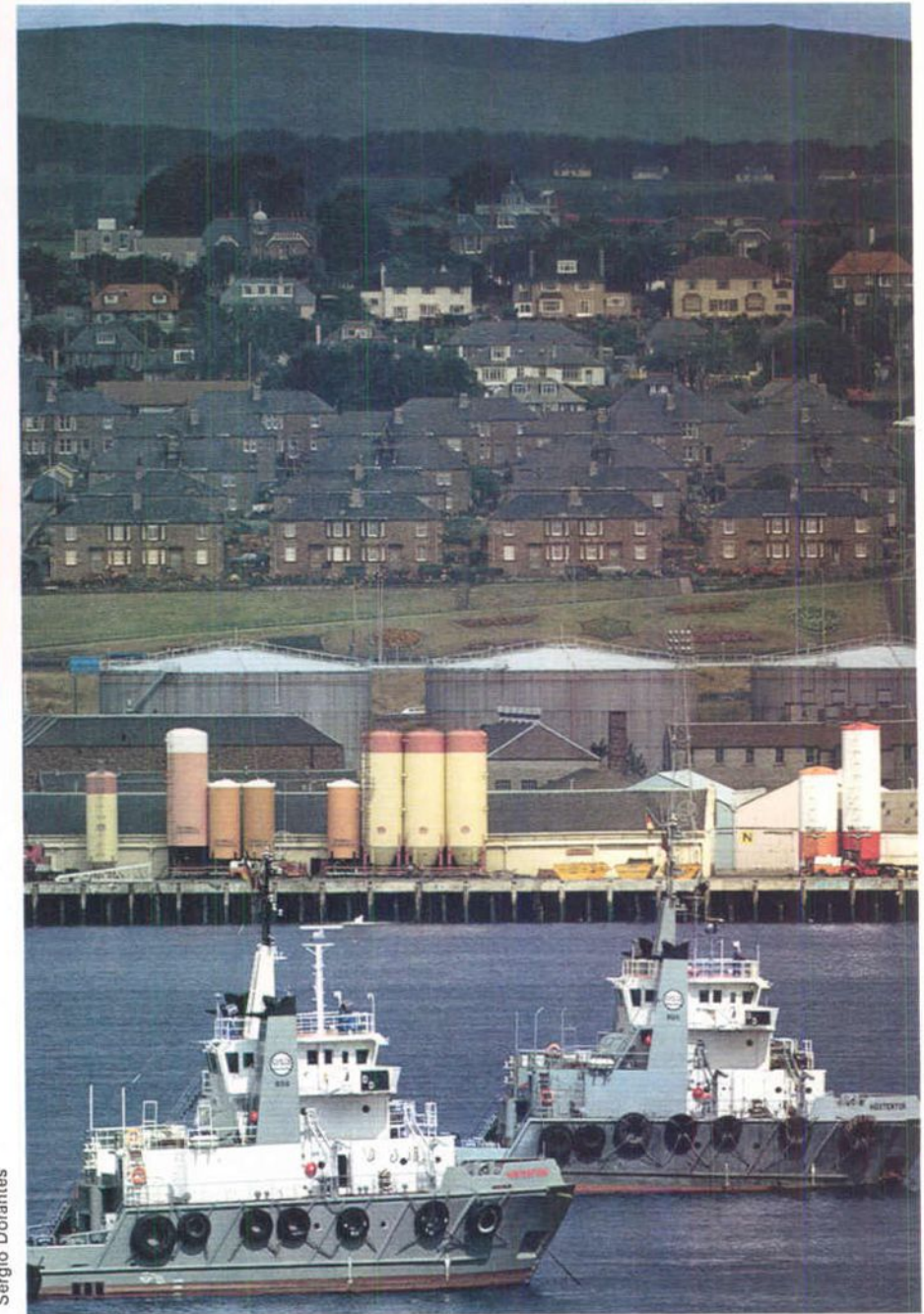
You might notice a slight darkening at the top of the focusing screen when you have a catadioptric lens fitted to the camera. This is caused by the reflex mirror in the camera body not being quite big enough to reflect the whole of the image. This is not a great problem, and does not show up on the film, though it may affect the exposure meter in your camera.

Exposure control

Metering systems in SLR cameras are designed with an average lens in mind, and they work well with lenses in the 20 to 200 mm range. Outside these limits, the indicated exposure may not be quite correct, though this will depend on the exact position of the light sensitive cells in the camera body.

The lack of iris diaphragm does not help, because shutter speed priority cameras rely on this to set the exposure. Before you take any important pictures using a mirror lens, it is a good idea to check that your built-in meter works correctly with it.

First, find out whether it can be used on the automatic setting. If the camera has aperture priority metering, this should be possible, but if it is a shutter



Sergio Dorantes

priority model, you must use it in the manual mode. In this case, the meter is balanced using the shutter speed control and neutral density filters, though these are only necessary with very fast film or in bright sunlight.

Cameras with manual metering are operated in the same way, but if your camera does not have a TTL meter, you may have problems. The angle of view of a mirror lens is much narrower than that of a hand held or non-TTL meter, so a separate spotmeter is necessary to make sure that the exposure is correct.

Even if the camera's meter appears to function normally, it still may not be giving the correct exposure to the film. It is best to make a series of test exposures on slow colour transparency film before using the lens for serious photography. This film has little exposure latitude, so metering errors show up

River estuary Like any long telephoto, a mirror lens can produce very dramatic pictures by flattening out perspective

clearly. Make the exposures at the setting indicated by the camera, and then at $\frac{1}{2}$, 1, $1\frac{1}{2}$ and 2 stops over- and underexposure. Keep a careful record of the exposures, and from the series of nine pictures, pick the best, and work out whether your exposure meter needs to be set to a different ASA value to compensate for over- or underexposure.

Getting the best results

Mirror lenses are no better or worse than conventional long telephotos. The two types of lens have different characteristics, and are subject to different applications.

Bright sunlight and contrasty lighting suit mirror lenses, because in overcast



Jon Gardey/Robert Harding Associates

Setting sun *The moon and sun can make exciting subjects if you use a long catadioptric lens*

conditions and with very flat subject matter, they tend to give a hot spot in the middle of the frame. This slight unevenness of exposure is a characteristic of all mirror lenses, but is minimized on the newer designs. In contrasty light, it is unnoticeable and even in dull light the darker corners may not be noticed.

The central obstruction of a mirror lens reduces the contrast of the image, so when photographing through haze a conventional refracting lens will give more contrasty results.

If you need to be very mobile, a mirror lens is a good choice—its light weight and small size make it the first choice for travelling photographers, or in situations where there is a lot of action going on which would make the use of a tripod difficult or dangerous. If you need to move quickly, or to pack a lot of equipment, a conventional long lens is a tremendous handicap.

Whenever there are bright highlights in a picture, the out of focus circles produced by a catadioptric lens can make a very attractive picture. Backlit portraits take on a sparkling, unreal quality. Pictures at night, or over expanses of sunlit water, offer a lot of potential for a mirror lens user.

The shallow depth of field produced by a mirror lens can be used to isolate subjects—a figure can be picked out in a crowd, or the subject of a portrait isolated from a background. The dough-

nut shaped circles of confusion shatter background detail to an even greater extent than with normal lenses, so objects at close distances seem even more isolated.

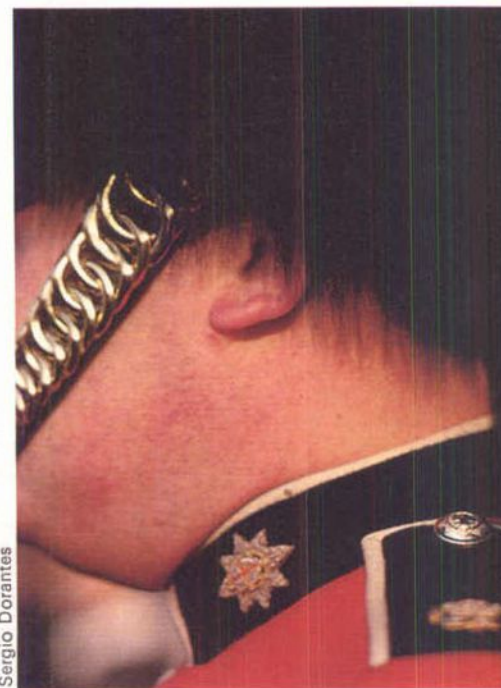
This shallow depth of field can cause problems—when a 500 mm mirror lens is focused at 20 metres, depth of field extends only 20 cm on either side of the plane of sharp focus. When you need a lot of depth of field, stick to a conventional lens and stop down.

Just like any long lens, a catadioptric will appear to compress perspective when focused on distant objects. Buildings and hills appear to be stacked up on top of each other, and this can be used to produce very striking pictures. Over long distances, atmospheric haze gives a veiled appearance to a picture, and cuts down contrast. This can cause problems, because of the inherent low contrast of mirror lenses. The solution with black and white film is to increase development, but there is little you can do if you are shooting pictures in colour.

Because they have quite a small aperture, mirror lenses must be used with fast film, and to hand hold them, you must use film faster than 125 ASA. In overcast weather, you may find yourself using 400 ASA(ISO) film, pushing it by one stop if you do not wish to use a tripod. Fortunately, this procedure will give a boost to film contrast, which is very welcome in dull conditions.

Military man *At its closest focusing distance, a mirror lens can take an unusual view of a familiar subject*

The unique characteristics of mirror lenses make it crucial that you use them with care, and pick the right subjects. They are not the answer to every photographer's prayer, and there are some circumstances where a conventional lens does a better job. On the other hand, if you stick to the general principles outlined here, there is no reason why you should not get some striking pictures which make good use of these compact, lightweight lenses.



Sergio Dorantes